UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

2025791

MEMORANDUM
June 8, 2004

SUBJECT: Record of Decision Amendment for the South Indian Bend Wash Superfund Site Tempe, Arizona

TO: Kathleen Johnson, Chief
Federal Facilities Cleanup Branch (SFD-8)

FROM: Melissa Pennington
Remedial Project Manager (SFD-8-2)

THRU: Sean Hogan, Chief
Private Sites and DOE Section (SFD-8-2)

Attached for your review and signature is the Record of Decision Amendment (ROD Amendment) for the South Indian Bend Wash Superfund Site (SIBW or "the Site"). This ROD Amendment selects a new remedy for the western plume at SIBW and is intended to be the final decision document for groundwater at the Site. This ROD Amendment has been reviewed by the regional SIBW site team including Office of Regional Counsel. The State of Arizona concurs with this remedy change.

Groundwater contamination at the Indian Bend Wash Superfund Site was discovered in 1981 when elevated levels of VOCs including trichloroethylene (TCE) and tetrachloroethylene (PCE) were found in several Scottsdale-area drinking water wells. As a result, local water providers stopped using those wells for drinking water.

EPA and ADEQ have been involved in investigations and cleanup activities at the Site since the initial discovery of VOCs in the groundwater in 1981. The entire Site, including both NIBW and SIBW, was placed on the NPL in 1983. On September 30, 1998, EPA issued a Record of Decision for VOCs in Groundwater (1998 Groundwater ROD). The 1998 Groundwater ROD addressed all three groundwater plumes at the SIBW Site: the western plume, the central plume and the eastern plume. The remedy selected for the western plume was extraction and treatment, and the remedy selected for the central and eastern plumes was monitored natural attenuation (MNA).

This ROD Amendment officially changes the remedy for the western plume from extraction and treatment to MNA and does not in any way alter the remedy previously selected for the central and eastern plumes. The MNA remedy selected in this ROD Amendment includes evaluation of the need for additional monitoring wells and long-term monitoring of the groundwater. In the event that MNA does not perform as anticipated and the cleanup standards are not reached within projected timeframes, a contingency remedial action of extraction and treatment for the western plume is also selected as part of this ROD Amendment. The cleanup standards for the contaminants of concern (TCE and PCE) are being set at Safe Drinking Water Act Maximum Contaminant Levels.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

June 21, 2004

MEMORANDUM

SUBJECT: Record of Decision Amendment for the South Indian Bend Wash Superfund Site, Tempe, Arizona

FROM: James Collins
Assistant Regional Counsel

THROUGH: Allyn Stern
Senior Counsel

TO: Marie Rongone
Acting Hazardous Waste Branch Chief

I. INTRODUCTION

The Region IX Superfund Division has prepared a Record of Decision Amendment ("ROD Amendment") for the South Indian Bend Wash Superfund Site ("SIBW" or the "Site"). The ROD Amendment (attached) selects a new remedy for the western plume at SIBW and is intended to be the final decision document for groundwater at the Site. The State of Arizona concurs with this remedy change.

II. BACKGROUND

Groundwater contamination at the Indian Bend Wash Superfund Site was discovered in 1981 when trichloroethylene ("TCE") and tetrachloroethylene ("PCE") (collectively "VOCs") were discovered in drinking water wells. EPA and the Arizona Department of Environmental Quality ("ADEQ") have been involved in investigation and cleanup at the Site since the initial discovery of VOCs in groundwater. The Indian Bend Wash Site was placed on the National Priorities List in 1983, and subsequently divided into the North Indian Bend Wash Site and the South Indian Bend Wash Site. This ROD Amendment concerns only the SIBW Site.

On September 30, 1998, EPA issued a Record of Decision for VOCs in Groundwater at SIBW (the "1998 Groundwater ROD"). The 1998 Groundwater ROD addressed three contaminated groundwater plumes at SIBW: the western plume, the central plume, and the eastern plume. The remedy selected for the western plume was extraction and treatment, and the remedy selected for the central and eastern plumes was monitored natural attenuation ("MNA").

III. THE ROD AMENDMENT

This ROD Amendment changes the remedy for the western plume from extraction and treatment to MNA, and does not alter or affect the remedy previously selected for the central and eastern plumes. Data collected since the issuance of the 1998 Groundwater ROD supports this remedy change, as set out in detail in the ROD Amendment, and MNA will be more cost effective than extraction and treatment.

The MNA remedy for the western plume includes evaluation of the need for additional monitoring wells and long term monitoring of groundwater. In the event MNA does not perform as anticipated, and cleanup standards are not achieved within the projected timeframes, a contingency remedial action of extraction and treatment is also selected as part of this ROD Amendment for the western plume. The cleanup standards for TCE and PCE are set at Safe Drinking Water Act Maximum Contaminant Levels.

There are no controversial issues or unusual ARARs determinations implicated in this ROD Amendment.

IV. CONCLUSION

We recommend that the Office of Regional Counsel concur on the ROD Amendment for SIBW.

APPROVED:

Marie Rongone

Marie Rongone, Acting Hazardous Waste Branch Chief
Office of Regional Counsel

6/21/04
Date

RECORD OF DECISION AMENDMENT

for the

SOUTH INDIAN BEND WASH SUPERFUND SITE
GROUNDWATER OPERABLE UNIT

TEMPE, ARIZONA

U.S. Environmental Protection Agency
Region IX
San Francisco, California

June 2004

PART 1: THE DECLARATION

I. Site Name and Location

South Indian Bend Wash Superfund Site
Groundwater Operable Unit
Tempe, Maricopa County, Arizona
EPA ID. No. AZD980695969

II. Statement of Basis and Purpose

This decision document presents the amended selected remedial action of the United States Environmental Protection Agency (EPA) for the western plume at the South Indian Bend Wash Superfund Site, located in Tempe, Maricopa County, Arizona (SIBW or the Site). This action has been chosen in accordance with Section 117 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, 42 U.S.C. § 9617, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR § 300.435(c)(2)(ii). This decision is based on EPA's Administrative Record file.

The lead agency for the remedial effort at this Site is EPA and the support agency is the Arizona Department of Environmental Quality (ADEQ). The state concurs with the remedy selected in this ROD Amendment which changes the remedy for the western plume selected for the volatile organic compounds (VOCs) in the Groundwater Record of Decision (1998 Groundwater ROD).

III. Assessment of Site

The response action selected in the 1998 Groundwater ROD, as modified by this ROD Amendment, is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances, pollutants, and/or contaminants from this Site which may present an imminent and substantial endangerment to public health or welfare.

IV. Description of Selected Remedy

This ROD Amendment modifies the previously selected groundwater remedy for one of the three contaminated groundwater plumes at the SIBW Site.

A remedial action was selected for all three groundwater plumes at SIBW (western, central and eastern plumes) in September 1998 (1998 Groundwater ROD). This ROD Amendment is changing the remedy for the western plume only. The original remedial action for the western plume at SIBW was extraction and treatment. The amended remedial action is Monitored Natural Attenuation (MNA). The goal for MNA in the western plume is aquifer restoration.

The MNA remedy selected in this ROD Amendment includes evaluation of the need for additional monitoring wells and long-term monitoring of the groundwater. In the event that MNA does not perform as anticipated and the cleanup standards are not reached within projected timeframes, a contingency remedial action of extraction and treatment for the western plume is also selected as part of this ROD Amendment.

At the time that the 1998 Groundwater ROD was issued, EPA did not have adequate data for the western plume to demonstrate that contaminant levels were decreasing, natural attenuation was occurring, and that cleanup standards could be met within a reasonable timeframe. Since that time, EPA has gathered a significant amount of groundwater data for the western plume, including data from three new monitoring wells installed in 2001. An evaluation of the most recent groundwater data was conducted and documented in the MNA Memorandum. This technical memorandum includes calculations of contaminant decay rates and timeframes for meeting cleanup standards in the western plume.

Based on EPA's evaluation of the most recent data, it has been determined that the western plume is not migrating at the rate that was anticipated at the time of the 1998 Groundwater ROD. Additionally, current data indicates that the western plume is attenuating at a rate that exceeds its lateral movement. Therefore, the plume is considered relatively stable. The current data indicate that the MNA remedy will meet cleanup standards in approximately four to five years. Therefore, it is not necessary to implement the remedy selected in the 1998 Groundwater ROD in order to protect human health and the environment. It is more cost-effective to change the 1998 Groundwater ROD as described in this ROD Amendment.

There are no known continuing source areas or Non-Aqueous Phase Liquids (NAPLs) present at SIBW and as a result principal threat waste was not considered for this Site.

The remedial action for soils at SIBW was selected in September 1993. The soils remedy is not being changed as part of this ROD Amendment.

V. Statutory Determinations

The Selected Remedy attains the mandates of CERCLA Section 121 and to the extent practicable, the NCP. Specifically, the remedy is protective of human health and the environment, complies with all Federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost-effective, and utilizes permanent solutions to the maximum extent possible.

The selected remedy does not include active treatment as a principal element and therefore does not satisfy the statutory preference for treatment as a principal element of the remedy. However, MNA will achieve the groundwater cleanup levels in a reasonable timeframe (less than 10 years) and in a cost-effective manner.

Because it may take more than five years to attain remedial action objectives and cleanup levels, a policy review shall be conducted within five years of construction completion for the SIBW western plume remedy to ensure that the remedy is, or will be, protective of human health and the environment.

VI. Authorizing Signature

Kathleen Johnson, Chief
Federal Facility and Site Cleanup Branch

6/24/04
Date

PART 2: THE DECISION SUMMARY

I. Site Name, Location, and Description

This Record of Decision Amendment (ROD Amendment) addresses the South Indian Bend Wash Superfund Site (SIBW or the Site), which is located in Tempe, Arizona. The CERCLIS Identification Number for the Site is AZD980695969. The lead agency is the U. S. Environmental Protection Agency (EPA) and the support agency is the Arizona Department of Environmental Quality (ADEQ). Historically, the Site has been partially addressed as an enforcement-lead site and partially addressed as a fund-lead site. The expected source of cleanup monies is both a settlement with Potentially Responsible Parties (PRPs) and the Superfund.

The Site originally consisted of distinct isolated areas of soil contamination and groundwater contamination plumes. At this time, most of the soil contamination has been remediated. This ROD Amendment focuses on groundwater only. More information on SIBW soil contamination and cleanup activities can be obtained from the 1993 VOCs in the Vadose Zone Record of Decision administrative record and supplements at the information repository located at the Tempe Public Library, 3500 Rural Road, Tempe, Arizona.

The groundwater is present in three separate levels or layers. These layers are referred to as the Upper, Middle, and Lower Alluvial Units (UAU, MAU, and LAU respectively). Such units are also known as aquifers. At SIBW, just the UAU and MAU are contaminated. There are three separate plumes of groundwater contamination at SIBW known as the western, central and eastern plumes. This ROD Amendment addresses the western plume only.

The entire area of the Indian Bend Wash Superfund Site covers approximately 13 square miles in Scottsdale and Tempe, Arizona. The site was divided into two areas known as North Indian Bend Wash (NIBW - located in Scottsdale) and South Indian Bend Wash Area (SIBW - located in Tempe) (See Figure 1, page 5)[1]. This ROD Amendment focuses on SIBW groundwater only. More information on NIBW can be obtained at the information repository located at the Scottsdale Civic Center Library at 3839 N. Drinkwater Blvd., Scottsdale, Arizona.

II. Site History, Enforcement Activities, and Basis for this ROD Amendment

There are numerous industrial facilities located in the SIBW area. Up until the 1970s, before our current environmental regulations existed, industrial solvents containing volatile organic compounds (VOCs) were typically disposed of directly onto the ground or in dry-wells. These disposal practices, along with other releases, resulted in soil and groundwater contamination at SIBW.

Groundwater contamination at the Indian Bend Wash Superfund Site was discovered in 1981 when elevated levels of VOCs including trichloroethylene (TCE) and tetrachloroethylene (PCE)

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[1] The boundaries shown on Figure 1 for NIBW and SIBW are not the legal boundaries of the sites. The boundaries identified on this figure depict the study areas for NIBW and SIBW. The actual boundaries of the NIBW site are based on the definition of "facility" in CERCLA Section 101(9).

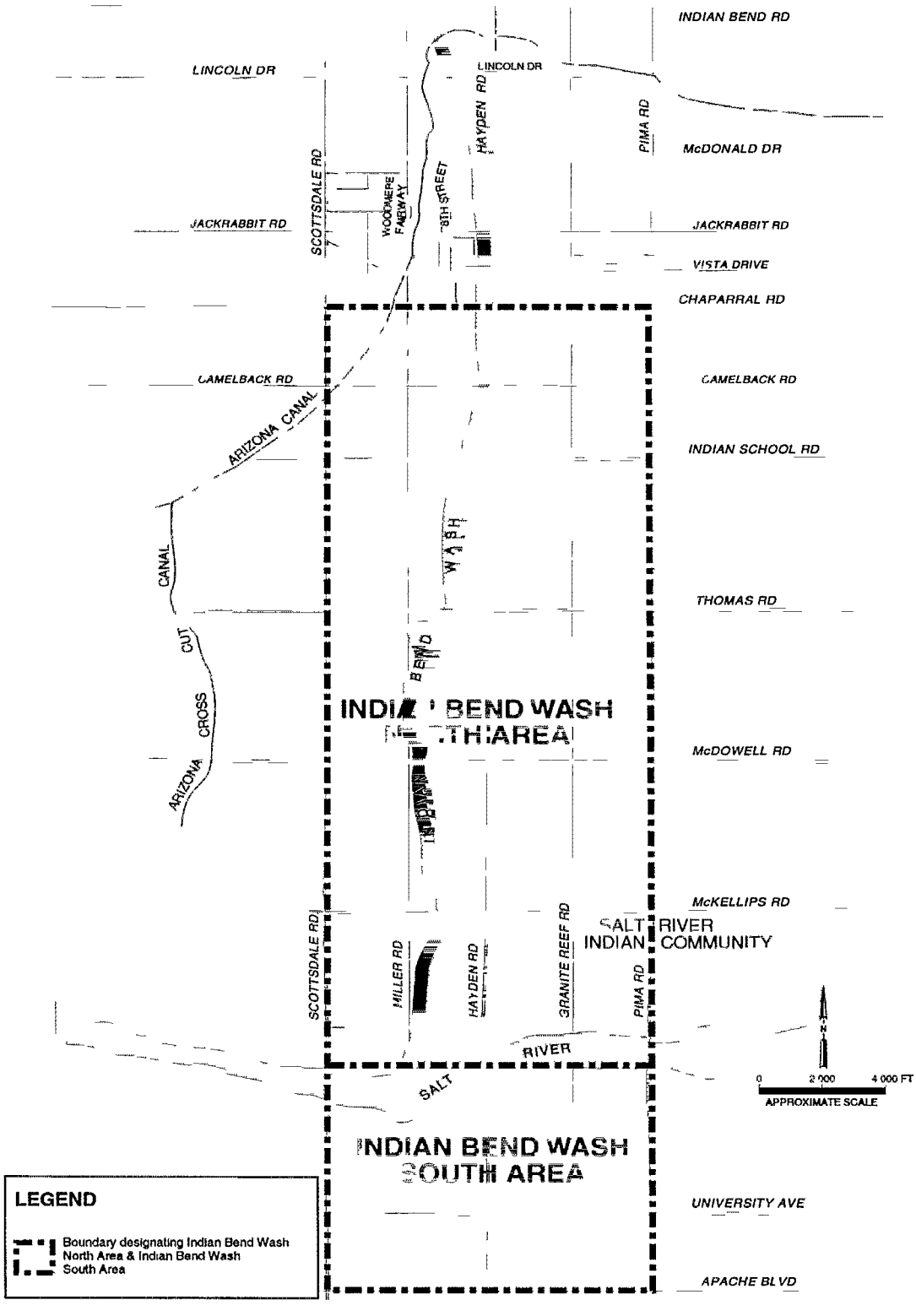

Figure 1: Indian Bend Wash Superfund Site

were found in several Scottsdale-area drinking water wells. As a result, local water providers stopped using those wells for drinking water.

EPA and ADEQ have been involved in investigations and cleanup activities at the Site since the initial discovery of VOCs in the groundwater in 1981. The entire Site, including both NIBW and SIBW, was placed on EPA's National Priorities List (NPL) in 1983. Since that time, EPA has conducted several investigations to determine the nature and extent of soil and groundwater contamination at the Site. The contamination at NIBW was found to have originated from a limited number of larger industrial facilities. Conversely, within SIBW, the groundwater contamination appears to have had several sources, from mid-sized industrial facilities to small privately owned businesses.

In accordance with NCP § 300.430(a)(1)(ii)(A), SIBW was investigated in two phases, typically referred to as Operable Units (OUs). Although the timeframes for these investigations overlapped for a short time, the soil contamination at SIBW is considered the first phase or Soils Operable Unit (Soils OU)[2]. The second phase was the Groundwater Operable Unit (Groundwater OU)[3].

A. Remedy Selection for Soils OU

EPA issued a Record of Decision for the Soils OU on September 27, 1993 (1993 Soils ROD). The 1993 Soils ROD established criteria for determining whether soils at a particular location might contribute to future groundwater contamination or pose a threat to public health, and selected soil vapor extraction (SVE) as the remedy when those criteria are met. Investigations were required to be conducted at certain facilities in the Tempe area identified as potential sources of groundwater contamination. These investigations are known as "Focused Remedial Investigations" or FRIs. After the FRIs have been conducted at each facility, EPA compared the results to the standard criteria. If a facility meets the specified conditions, then SVE is required to be implemented at that facility.

Once EPA has made a decision regarding whether or not a particular facility meets the criteria, EPA issues a "Plug-in Determination Document" and makes the FRI Report available for the public to review. To date, EPA has issued two Plug-in Determinations as described below. Subsequent Plug-in Determinations will be issued to address the remaining SIBW subsites.

The first Plug-in Determination was issued in February 1994 for the DCE Circuits Subsite. Soil cleanup was required at DCE Circuits, and this cleanup is currently nearing completion. The second Plug-in Determination was issued in January 2002 for the following seven facilities: Circuit Express, Allstate Mine Supply, Desert Sportswear, Cerprobe, Service and Sales, and the City of Tempe Right-of-Way. EPA determined that soil cleanup was not required at any of these facilities. More information about these

[2] The Soils OU is also referred to as the "VOCs in Vadose Zone Operable Unit."

[3] The Groundwater OU is also referred to as the "VOCs in Groundwater Operable Unit."

facilities and the Plug-in Determination Documents can be found in the SIBW Administrative Record files at the Tempe Public Library.

B. Investigations of and Remedy Selection for the Groundwater OU

In 1988, EPA began an intensive investigation of contamination at SIBW. The data available at the time indicated that the concentrations of VOCs in groundwater at SIBW were present at concentrations above the Safe Drinking Water Act (SDWA) Maximum Contaminant Levels (MCLs). All known contaminated groundwater production wells at SIBW had already been shut down by the appropriate local authorities to prevent exposure to groundwater contaminated above MCLs.

EPA's Remedial Investigation (RI) for SIBW achieved two objectives:

(1) Performance of soil and source investigations to document the locations of groundwater contamination sources; and

(2) Performance of a regional groundwater investigation to document the nature and extent of groundwater contamination as well as regional groundwater conditions.

The source investigation, combined with the regional groundwater investigation, determined that the groundwater contamination at SIBW was not contiguous with the NIBW groundwater plume. The groundwater investigation examined the overall presence of contaminants in groundwater and the movement of groundwater across the entire site. Contamination in the soil or soil gas at a facility can migrate downward and enter groundwater. Once in groundwater, it can flow away from the facility and become more widespread and develop into a potential regional problem. The regional groundwater investigation therefore recognized individual sources, but adopted a regional perspective on contaminant movement.

Soil, soil gas, and groundwater data and interpretations were collectively incorporated into the Final RI Report (EPA, 1997). The Groundwater Feasibility Study (Groundwater FS) was completed by EPA in August 1997. The Groundwater FS evaluated cleanup alternatives for the three groundwater plumes identified at SIBW.

On September 30, 1998 EPA issued a Record of Decision for VOCs in groundwater (1998 Groundwater ROD). The 1998 Groundwater ROD addressed all three groundwater plumes at the SIBW Site: the western plume, the central plume and the eastern plume. The remedy selected for the western plume was extraction and treatment, and the remedy selected for the central and eastern plumes was monitored natural attenuation (MNA).

This ROD Amendment focuses on amending the remedy selected for the western plume and does not in any way alter the remedy selected for the central and eastern plumes. Cleanup of the western plume is considered to be a fund-lead action. In other words, EPA is conducting the cleanup and paying for it out of the federal "Superfund" and SIBW special accounts.

C. Groundwater Enforcement Actions

In December 1997 and January 1998, EPA issued general notice letters specifically for the groundwater contamination at SIBW. These general notice letters were sent to parties associated with facilities or subsites believed to be sources of groundwater contamination at SIBW. EPA began negotiations with four of the Potentially Responsible Parties (PRPs). Only one of the four PRPs, IMC Magnetics, Inc. (IMC), signed a consent agreement with EPA to do work on the central and eastern plumes. This work included installation of monitoring wells, groundwater sampling, groundwater modeling and production of a report regarding the status of the MNA remedy. IMC is working cooperatively with EPA and, based on current information, the MNA remedy appears to be effectively cleaning up the central and eastern plumes. It is anticipated that IMC's work on the central and eastern plumes will be complete by the end of June 2004.

EPA is continuing to work with IMC and the remaining PRPs to resolve their liability with regard to the overall costs EPA has expended on SIBW soil and groundwater investigation and cleanup activities.

D. Basis for Change of Remedy

Following issuance of the 1998 Groundwater ROD, some data gaps needed to be filled before EPA could proceed with design and construction of the extraction and treatment remedy for the western plume. First, additional groundwater data was needed. EPA has continued to collect groundwater monitoring data from the western plume on a quarterly basis to gather this needed information. Second, in order to determine the southern boundaries of the western plume, three additional monitoring wells were installed early in 2001. Once EPA had collected and evaluated this additional data it became apparent that the selection of extraction and treatment as the remedy for the western plume should be re-evaluated.

When historical data is compared with current data, it is evident that the western plume has migrated downgradient, moving south to southwest with the prevailing groundwater flow direction, but that TCE concentrations have significantly decreased. During the RI, TCE was detected at concentrations as high as 540 μg/l in monitoring well SIBW-5U. TCE concentrations in this same well are currently below the MCL. Based on the most recent data (January 2004), the highest TCE concentration in monitoring well SIBW-28U is 6.3 μg/l. Only five years ago, at the time the 1998 Groundwater ROD was issued, this same monitoring well had a TCE concentration of 43 μg/l.

This ROD Amendment presents EPA's final cleanup decision for the western plume based on evaluation of the most recent data.

III. Community Participation

EPA currently maintains SIBW information repositories at EPA Region IX Office in San Francisco, and at the Tempe Public Library. EPA Region IX Office and the Tempe Public Library maintain copies of the Administrative Record file on microfilm. EPA maintains a computerized mailing list database for SIBW. All SIBW fact sheets are mailed to the individuals and businesses included in this database. All EPA fact sheets

for SIBW provide a return coupon and telephone numbers that one could use to be placed on the mailing list.

EPA also operates a toll-free information message line (800/231-3075) to enable interested community members to call EPA with questions or concerns about NIBW or SIBW site activities. The message line is publicized through newspaper notices and EPA fact sheets. In the last several years the public's interest in activities at SIBW has declined significantly in comparison to the early 1990's.

Table 1 (below) presents a chronological list of other community relations activities that EPA has conducted for SIBW to ensure community involvement and to comply with the public participation requirements of CERCLA §113(k)(2)(B) and CERCLA §117.

Table 1: SIBW Community Participation Highlights

September 1984	Released a community relations plan based upon interviews with Phoenix, Scottsdale, and Tempe residents and state and local officials.
December 1990	Distributed a fact sheet to all persons on the mailing list providing information on SIBW and groundwater monitoring and soils investigations.
Throughout 1991	Distributed a flyer to residents near EPA's well drilling activities throughout the study area, which explained the reason for, and nature and context of, the well drilling.
May 1991	Distributed a flyer and held a public meeting to update the community on the findings of the Remedial Investigation.
January 1992	Updated the 1984 community relations plan to reflect new site communication strategies and information from residents, officials, and other members of the community.
December 1992	Distributed a flyer to residents in a surrounding neighborhood of the former DCE Circuits facility where EPA was beginning fieldwork to explain upcoming activities.
April 1993	Distributed a fact sheet updating the community on activities at SIBW.
May 1993	Issued a flyer to residents affected by EPA's well drilling activities informing them of the reason for, and nature and context of, the activities.
June 1993	Held informal meetings with citizens and PRP groups to present EPA's proposal for VOCs-in-Vadose-Zone remedy.
June 7, 1993	Issued Proposed Plan for the VOCs-in-Vadose-Zone remedy at SIBW.
June 9, 1993	Issued press release about the proposed VOCs-in-Vadose-Zone remedy.
July 1993	Held an open house session at Gililland Jr. High School in Tempe to present EPA's proposed remedy for VOCs in the Vadose Zone.
July 1993	Extended Public Comment period to August 14, 1993, on VOCs-in-Vadose-Zone remedy.
July 7, 1993	Held a formal Proposed Plan public meeting at Gililland Middle School in Tempe.
August 1996	Issued fact sheet on SVE at the DCE Circuits Site.

September 1997	Issued Proposed Plan for cleanup of contaminated groundwater at SIBW.
September 24, 1997	Held a formal Proposed Plan public meeting for groundwater remediation held at Gililland Middle School, Tempe, AZ.
October 1997	Extended Public Comment Period to November 28, 1997, on the Proposed Plan for groundwater cleanup.
August 1998	Met with stakeholders to describe the ROD contingency plans for the MNA portions of the remedy.
February 2002	Issued fact sheet regarding Plug-in determination for seven subsites at SIBW.
January 2004	Distributed a flyer to residents in a surrounding neighborhood of the former DCE Circuits facility regarding soil boring and sampling activities occurring at the site.
February 2004	Issued Proposed Plan for amendment to the 1998 Groundwater ROD at SIBW.
March 2004	Held a formal Proposed Plan public meeting for amendment of the 1998 Groundwater ROD held at Holdeman Elementary School in Tempe, AZ.

IV. Scope and Role of the Operable Unit or Response Action

SIBW is a relatively complex site with groundwater contamination present in two of the three existing aquifers. In order to manage the Site in the most effective manner, EPA divided the Site into a Soils Operable Unit (Soils OU) and a Groundwater Operable Unit (Groundwater OU). This ROD Amendment revises the 1998 Groundwater ROD as described below. EPA anticipates that the remedial actions selected in this ROD Amendment will be implemented by EPA using Superfund monies or SIBW special accounts. A description of SIBW decision documents is as follows:

A. EPA signed the 1993 Soils ROD on September 27, 1993. This ROD established criteria for determining whether soils at a particular location might contribute to future groundwater contamination or pose a direct exposure threat to public health. This ROD selected SVE as the remedy when the criteria mentioned above are met. Investigations were required to be conducted at specific facilities in the Tempe, Arizona area to determine if SVE should be required to be implemented at such facilities. The 1993 Soils ROD is not being revised by this ROD Amendment.

B. EPA signed the 1998 Groundwater ROD on September 30, 1998. This ROD selected cleanup actions for all three groundwater plumes at the SIBW Site: the western plume, the central plume and the eastern plume. The remedy selected for the western plume was extraction and treatment, and the remedy selected for the central and eastern plumes was MNA.

C. This document is an amendment to the 1998 Groundwater ROD. This ROD Amendment documents EPA's decision to revise the selected remedy for the western plume only. This ROD Amendment is consistent with but does not alter the remedy selected in the 1993 Soils ROD or the remedy selected for the central and eastern plumes in the 1998 Groundwater ROD. This ROD Amendment is anticipated to be the final decision document for SIBW.

V. Site Characteristics

A. Conceptual Site Model

The Conceptual Site Model for the risk assessment and response actions for SIBW groundwater was developed at the time the 1998 Groundwater ROD was issued. The potential future risk associated with ingestion, inhalation, or dermal contact with contaminants in groundwater was the driving factor of the 1998 Groundwater ROD.

At this time, although some of the work required by the 1998 ROD is complete, the Conceptual Site Model for potential risk and exposure remains the same. This final ROD for SIBW will be based on reduction of risk due to the potential for exposure to contaminated groundwater.

Exposure through the use of contaminated groundwater from private drinking water wells or public drinking water supplies could include ingestion, inhalation, and dermal contact with elevated levels of VOCs. Because the risk and the Conceptual Site Model remain the same, a new risk assessment was not conducted and the remedy selected in this ROD Amendment will be based on all of the Site data that has been generated to date and the risk assessment conducted for the 1998 Groundwater ROD.

An ecological risk assessment evaluates risks posed to ecological receptors. An ecological risk assessment need not be performed for the Groundwater OU at SIBW because groundwater does not discharge to surface water. No upwelling is known to occur in the vicinity of the Salt River, and vertical gradients are downward. Because no current or future pathways of exposure to VOC-contaminated groundwater exist for ecological receptors at SIBW, an ecological risk assessment was not performed.

B. Overview of the Site

The SIBW Site encompasses approximately three square miles in the City of Tempe, Arizona and is located along the southwestern margin of the Paradise Valley basin. The SIBW study area was originally bounded by Apache Boulevard on the south, Rural/Scottsdale Road on the west, Price Road on the east, and is proximate to Curry Road on the north. These boundaries are depicted on Figure 1, page 5.

The groundwater contamination has migrated beyond the study area boundaries and has therefore expanded the area of the Site. The most recent groundwater data for the western plume (which is the subject of this ROD Amendment) indicates that the plume is as far south as Alameda Drive and as far west as South College Avenue (see Figure 2 on page 12).

C. Surface and Subsurface Features

The surface topography of SIBW is generally flat. The Site is broken by buttes of rock and surrounded by mountains at the edges of the valley.

The principal surface-water features in the vicinity of the Site include the Indian Bend Wash, the Salt River, parts of the SRP canal system, and Tempe Town Lake. The Indian Bend Wash is a desert wash that has been converted to a series of urban ponds linked by

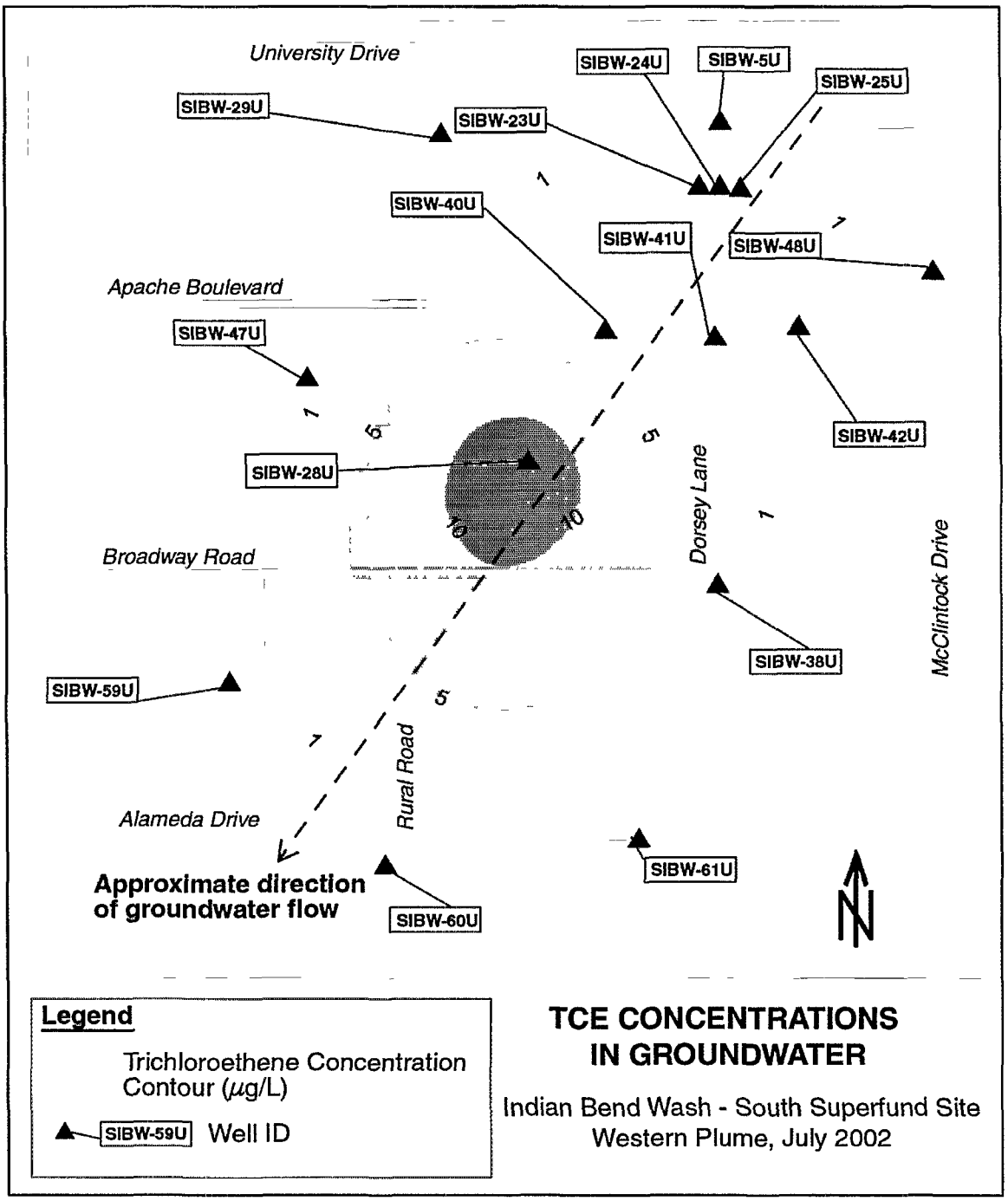

Figure 2: Extent of TCE Contamination

channels. The wash meets the Salt River at the northern boundary of the SIBW study area.

The surface ranges from 1,150 to 1,200 feet above mean sea level. Slopes do not generally exceed 2 percent. Slopes approaching 100 percent exist only at the banks of the Salt River which is located near the northern boundary of the Site. The Salt River is the primary surface-water body present within SIBW. Also, two minor surface-water bodies exist within or near the boundaries of SIBW. The Hayden Canal is a concrete-lined canal/underground pipeline used to distribute irrigation water by the Salt River Project (SRP). The City of Mesa operates wastewater recharge ponds offsite from SIBW to the northeast.

The Salt River flows only about 10 percent of the time, but its flow is unpredictable in any given year. Currently, the Salt River bed is mostly dry within SIBW. Prior to the 1940s, the Salt River was a perennial stream providing water to the Phoenix area for irrigation and recreation. Following development of the SRP canal system, the river became a dry riverbed for most of the year, flowing only in response to major rainfall.

Tempe Town Lake was conceived as a project to transform a portion of the dry Salt River bed into an urban lake to provide recreational opportunities and economic benefits. The lake is approximately 2 miles long and 200 acres in size. During seasonal flooding, the dams used to build the lake will be lowered to allow flood waters to pass downstream. When flooding stops, the dams will be raised to impound water for the lake once again.

The building on the DCE Circuits subsite is included in the National Register of Historic Places (Inventory No. 151). The groundwater remedy at SIBW will not affect this building.

D. Sampling Strategy

The Remedial Investigation (RI) for SIBW was conducted over a period of many years and included installation of over 50 monitoring wells. These monitoring wells were regularly sampled throughout the RI. The final RI Report was completed in 1997.

Following EPA's signature of the 1998 Groundwater ROD, EPA continued to sample the groundwater wells at SIBW on a quarterly basis to ensure that a complete set of data existed in order to design the remedies selected in the 1998 Groundwater ROD. In addition to water quality data and water levels, EPA has been collecting MNA parameter data for several years in order to evaluate the effectiveness of MNA as a remedy at the Site.

The SIBW soil sampling strategies are not covered in this section because soil remediation is not addressed as part of this ROD Amendment.

E. Known and Suspected Sources of Groundwater Contamination

At the time that the 1993 ROD was issued, approximately thirty facilities were considered potential source areas for VOC contamination at SIBW. Five of these facilities had either been issued unilateral orders or had signed consent orders to complete Focused Remedial Investigation (FRI) work. These five facilities were: DCE Circuits, Eldon Drapery, IMC Magnetics, Prestige Cleaners, and Unitog. Following

additional screening, it was determined that FRI work should also be conducted at the following subsites: Circuit Express, Allstate Mine Supply, Desert Sportswear, Cerprobe Corporation, Service and Sales, and the City of Tempe Right-of-Way.

A Plug-in Determination for the DCE Circuits subsite was signed by EPA on February 24, 1994. At that time, it was determined that DCE Circuits met the criteria to plug-in to the 1993 Soil ROD; therefore SVE was implemented at this subsite. Arizona Public Service made the determination that SVE was appropriate at its site in lieu of conducting FRI work. Arizona Public Service implemented SVE successfully at this subsite, and EPA approved their closure report in April of 2001 documenting that it had completed its soil cleanup.

In January 2002, EPA issued a Plug-in Determination document which publicized EPA's subsite-specific decision for the following seven SIBW subsites: Eldon Drapery, Circuit Express, Allstate Mine Supply, Desert Sportswear, Cerprobe Corporation, Service and Sales, and the City of Tempe Right-of-Way. This Plug-in Determination documented EPA's decision not to require SVE at these seven subsites.

IMC Magnetics' contractor, Malcolm Pirnie, Inc., completed an FRI for the IMC subsite in March of 2003. This FRI concluded that SVE was not required to be conducted at the IMC subsite. EPA approved this FRI in December 2003. A Plug-in Determination has not yet been issued to document this conclusion.

The remaining SIBW subsites, including but not limited to Prestige Cleaners and Unitog, will be addressed in subsequent Plug-in Determinations.

F. Types of Contamination and Affected Media

The contaminants of concern (COCs) found in soil and groundwater at SIBW are trichloroethylene (TCE) and tetrachloroethylene (PCE). Although other VOCs have been detected at lower concentrations, TCE and PCE make up the largest portion of the risk. Heavy metals do not appear to be present in the groundwater at SIBW. Table 1 below identifies the types and characteristics of the COCs.

Table 2: Types and Characteristics of Contaminants of Concern (COCs)

Contaminant/Abbreviation/Category	Mobility	Carcinogenic	Non-Cancer Risks
Trichloroethylene/TCE/ VOC	High	yes	yes
Tetrachloroethene/PCE/ VOC	High	yes	yes

Although the affected media at SIBW is both soil and groundwater, this ROD Amendment addresses groundwater in the western plume only.

G. Description of Aquifers, Sub-Surface Features, and Potential Routes of Migration

The complex geological formations underlying the SIBW study area, that may be affected by contamination, generally consist of three alluvial deposits. These three alluvial deposits or "units" have been designated the upper alluvial unit (UAU), middle

alluvial unit (MAU), and lower alluvial unit (LAU). In some locations, the LAU is underlain by the Red Unit, which consists of cemented sands, gravel, and clays. The portions of the alluvial units that store and transmit significant quantities of groundwater are considered the aquifers of concern at SIBW. Groundwater contamination in the western plume is only present in the UAU aquifer. Therefore, only the UAU is discussed in the following text. The MAU, LAU and the Red Unit are not discussed in detail below.

(1) Upper Alluvial Unit

The UAU is distributed across the entire SIBW study area, and generally has a uniform thickness. The UAU typically is found near or at the ground surface and extends to approximately 110 to 170 feet below ground surface (bgs). The UAU is normally divided into an upper layer of clay and sandy silt and a lower layer dominated by sand, gravel, cobbles, and boulders. The upper layer is typically not present near the Salt River channel, and thickens to more than 20 feet south of the channel.

Transmissivity data for the UAU have been gathered through 36 aquifer tests performed on UAU wells at the site to date.[4] The estimated transmissivity values varied widely from a low of 1,900 square feet per day (ft^2/day) to a high of 73,000 ft^2/day. The range of transmissivities corresponds to hydraulic conductivity values between approximately 30 feet per day (ft/day) and 1,000 ft/day. The results of these tests suggest that no clear spatial trend in transmissivity values can be identified; however, the values obtained appear to be log-normally distributed. This suggests that calculating the geometric mean of the transmissivity values is an appropriate method by which to obtain an average value for the data set. The geometric mean of the UAU transmissivity values is approximately 17,000 ft^2/day.

(2) Release Mechanisms of Contaminants from Source Areas

A wide variety of manufacturing industries currently operates, or has operated in the past, in the SIBW study area. Printed electronic circuit-board manufacturing, metal plating, commercial laundry cleaning, engine repair and manufacturing, vehicle repair, jewelry manufacturing, plastics manufacturing, and mortar and grout manufacturing represent some of the industrial activities that have occurred in the past. In the past, landfills were operated in the SIBW study area. Five landfills were deleted from the SIBW site in March 2003 because they did not contribute to groundwater contamination and did not pose a threat to the groundwater.[5] Some of the industries mentioned above used hazardous substances in their manufacturing process that could, if discharged into the ground in sufficient quantity, pose a threat to human health and the environment.

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[4] The transmissivity values in this paragraph were obtained from Section 2.2, Page II-8, of the 1998 Groundwater ROD.

[5] More information on this partial deletion can be obtained from the Deletion Docket which is maintained at EPA Region IX's Regional Office Superfund Records Center and the Tempe Public Library.

Hazardous substances most commonly used by industries at SIBW include degreasing and dry cleaning solvents, metal plating solutions, acid and base solutions, and fuel oils. When the hazardous substances used by a facility are released into the ground, the facility becomes a source of contamination.

Possible mechanisms for release of hazardous substances into the subsurface at SIBW are:

a. Surface spills or leakage from drums, tanks or other containers or processes;

b. Disposal of used or unneeded hazardous substances into dry wells, septic systems, or directly onto the ground surface;

c. Infiltration from industrial wastewater surface impoundments; and/or

d. Leakage from underground storage tanks

(3) Contaminant Movement in the Vadose Zone

One mechanism that affects contaminant movement in the vadose zone at SIBW is infiltration from source areas. Contaminants discharged from source areas migrate vertically downward under gravity and may also disperse horizontally as a result of capillary action. Infiltration of precipitation at SIBW serves to dissolve and/or displace the contaminants and transport them downward toward the groundwater table.

The water table elevation at SIBW exhibits significant temporal variation (elevation changes of up to 40 feet were observed during 1993). When the water table drops, some of the groundwater contamination may be left behind in the vadose zone, creating a "smear zone" of residual contamination in the vadose zone. Similarly, when the water table rises, some of the contamination adsorbed to sediments near the groundwater table may dissolve into the groundwater.

When contaminants move through the vadose zone, they will partition between mobile phases and relatively immobile phases when the contaminants are either sorbed by organic material or soil minerals. The mobility of contaminants through the vadose zone depends on both the contaminant and the vadose zone chemical and physical properties.

(4) Groundwater Movement in the Upper Alluvial Unit

Since contamination in the western plume does not span the other alluvial units present at SIBW, only groundwater movement in the UAU is discussed in this ROD Amendment. The following list summarizes conclusions regarding groundwater movement in the UAU within the SIBW study area:

a. Groundwater flow directions in the UAU are south to southwest during non-riverflow conditions in the Salt River. These flow directions shift to south to southeast during riverflow conditions in the Salt River when recharge influences groundwater flow directions.

b. Groundwater flow through the UAU originates mainly from Salt River recharge (during flow events) and lateral inflow moves vertically

downward, eventually entering the MAU.

c. The horizontal gradient in the UAU ranges from 0.0015 to 0.004 foot per foot (ft/ft) during non-riverflow conditions in the Salt River. Salt River recharge during riverflow conditions increases the horizontal gradient to 0.006 to 0.012 ft/ft.

d. The vertical gradient from the UAU to the MAU is downward throughout the study area and ranges from 0.15 ft/ft to 0.20 ft/ft without influence from Salt River flows. This downward gradient can increase to as high as 0.27 ft/ft during and directly following riverflow events.

e. The Salt River does not function as a groundwater divide during non-riverflow conditions when the river is dry, but becomes a groundwater divide during riverflow events.

f. No evidence exists to suggest that groundwater contamination originating from NIBW has been transmitted to SIBW, regardless of riverflow conditions.

(5) Contaminant Movement in the Upper Alluvial Unit

Groundwater and VOC contaminant movement varies throughout the Site and with depth. The following is a brief discussion of the predominant paths of contaminant movement within the UAU. Since contamination in the western plume does not span the other alluvial units present at SIBW, only contaminant movement in the UAU is discussed in this ROD Amendment.

The UAU is mainly comprised of permeable, coarse-grained sands and gravel. Contaminants enter the UAU by moving downward through the vadose zone, dissolving, and moving with the groundwater flow. Contaminants can also enter the UAU when the water table rises into contamination in the vadose zone. The contaminants then become soluble and move with prevailing groundwater flow.

Important characteristics of groundwater movement in the UAU at SIBW are the strong downward vertical hydraulic gradients, changes in groundwater flow directions, and horizontal hydraulic gradients caused by flow events in the Salt River. The changes in groundwater recharge patterns caused by intermittent flow in the Salt River have significant implications for contaminant transport at SIBW. The groundwater flow direction in the UAU shifts from south-southwest to south-southeast, and these shifts in flow direction may spread out areas of contamination. Also, the increased horizontal gradient may cause contaminants to move greater distances over shorter time periods.

Future groundwater conditions are expected to be similar to those observed in recent history, e.g., the flow directions and rate of groundwater movement will vary within similar ranges, and will be most affected by the frequency and durations of flow events in the Salt River.

The groundwater table fluctuates more than 50 feet at the Site. These fluctuations in groundwater levels can either leave residual areas of contamination when the water table falls, or cause vadose zone contaminants to become dissolved in the groundwater when the groundwater table rises.

H. Location of Contamination

Groundwater contamination at SIBW forms three contaminated areas, or plumes, referred to as the western, central, and eastern plumes. All three plumes are shown on Figure 3, Page 19. Since this ROD Amendment addresses the western plume only, the central and eastern plumes are not discussed further.

(1) Western Plume

The highest levels of VOC contamination at SIBW have been detected in the western plume. The primary contaminant of concern found in the western plume is TCE, and the MCL for TCE is 5 micrograms per liter (μg/l). A total of approximately 15 monitoring wells have been installed in the vicinity of the western plume. Figure 2 on page 12 shows the locations of these monitoring wells. Three of these wells, SIBW-59U, SIBW-60U and SIBW-61U were installed in January 2001 for the purpose of defining the southern boundary of the plume.

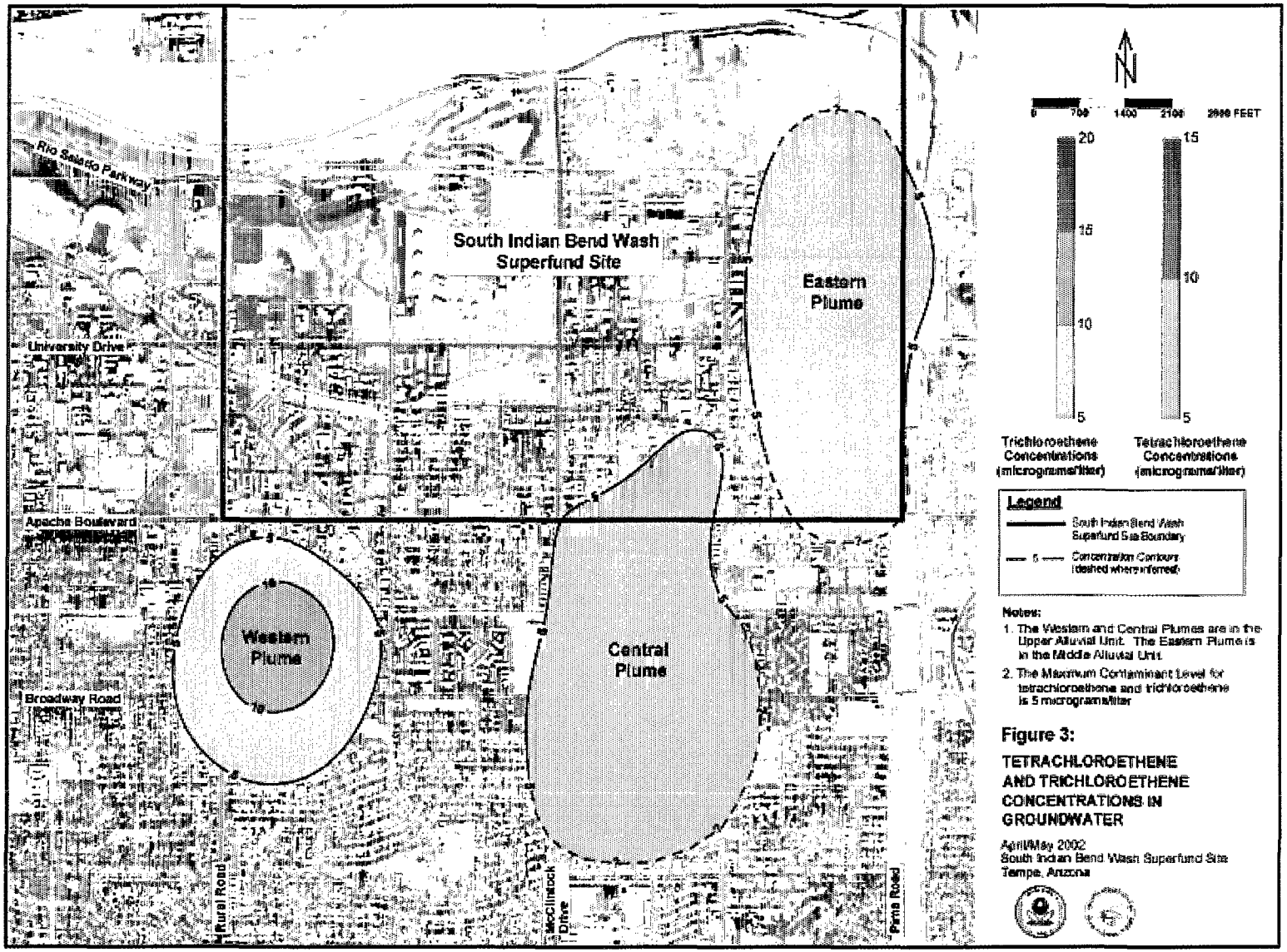
When historical data is compared with current data, it is evident that the western plume has migrated downgradient, moving south to southwest with the prevailing groundwater flow direction, but that TCE concentrations have significantly decreased. During the RI, TCE was detected at concentrations as high as 540 μg/l in monitoring well SIBW-5U. TCE concentrations in this same well are currently below the MCL. Based on the most recent data (January 2004), the highest TCE concentration in monitoring well SIBW-28U is (6.3 μg/l). Only five years ago, at the time the 1998 Groundwater ROD was issued, this same monitoring well had a TCE concentration of 43 μg/l.

VI. Current and Potential Future Land and Resources Uses

Land use in the SIBW area includes residential, industrial/commercial and recreational. Land north of University Avenue is primarily industrial or commercial. The area west of Hayden Road is strictly industrial and has zero population. The area east of Hayden Road has a limited population (just over 100 persons). Most of this population resides in mobile homes or trailers. The former SIBW landfills (deleted from the Site in March 2003) are located east of Hayden Road along the Salt River.

The areas east of Rural Road consists largely of off-campus housing for students. There are dormitories, athletic fields and the Arizona State University (ASU) golf course along the east side of Rural Road. Most of the land use east of Rural Road up to the project area's eastern boundary is single and multi-family residential housing. The eastern edge of the ASU golf course is bounded by McClintock.

Development plans for a regional retail center in the area deleted from the SIBW Site are moving forward. All necessary remediation in the deleted area is being overseen by ADEQ's Voluntary Remediation Program.


South Indian Bend Wash
Superfund Site
Eastern
Plume
Western
Plume
Central
Plume
Rio Salado Parkway
University Drive
Apache Boulevard
Broadway Road
Rural Road
McClintock
Drive
Price Road
0 700 1400 2100 2800 FEET
20
15
10
5
10
5
Trichloroethene
Concentrations
(micrograms/liter)
Tetrachloroethene
Concentrations
(micrograms/liter)
Legend
South Indian Bend Wash
Superfund Site Boundary
5
Concentration Contours
(dashed where inferred)
Notes:
1. The Western and Central Plumes are in the Upper Alluvial Unit. The Eastern Plume is in the Middle Alluvial Unit.
2. The Maximum Contaminant Level for tetrachloroethene and trichloroethene is 5 micrograms/liter
Figure 3:
TETRACHLOROETHENE
AND TRICHLOROETHENE
CONCENTRATIONS IN
GROUNDWATER
April/May 2002
South Indian Bend Wash Superfund Site
Tempe, Arizona

Groundwater at SIBW was used as a primary drinking water source for the City of Tempe (COT) until 1967, when the Papago Park Water Treatment Plant was constructed and COT began to rely predominantly on surface water supplies. Groundwater at SIBW continued to be used as a back-up or secondary drinking water source until contamination was discovered in the early 1980's. The affected wells have not been used as a drinking water source since that time. However, the COT does rely on groundwater from its municipal wells and from Salt River Project wells. In 2002 and 2003 approximately 6% of COT's municipal water supply was derived from municipal wells. Most of these supply wells are not located within or near the SIBW site. One well, COT #1, is located approximately 0.5 miles from the western plume. However, according to COT, sampling of this well has not detected any VOCs. COT samples all of their municipal supply wells on a quarterly basis.

The groundwater is also used for industrial purposes. The largest industrial use is for cooling water by the APS Ocotillo Power Plant. It should also be noted that, contaminated groundwater represents the loss of a groundwater resource that may be considered a primary source of drinking water by the State of Arizona in the future.

VII. Summary of Site Risks

According to the results of the Groundwater Risk Assessment presented as Appendix A in the Groundwater FS (EPA, 1997), exposure to contaminated groundwater might, in the future, pose levels of risk considered unacceptable under the NCP. The potential exposure pathway includes future use of untreated groundwater at SIBW for drinking or showering. It should be noted that technically an exposure pathway currently exists because the groundwater in the vicinity of SIBW is used to supplement the COT's water supply in times of drought. However, groundwater does not serve as a primary source of water supply at this time and only groundwater wells that are not contaminated are used by the COT.

Groundwater at SIBW was used as a primary drinking water source for the COT until 1967, when the Papago Park Water Treatment Plant was constructed and COT began to rely predominantly on surface water supplies. Groundwater at SIBW continued to be used as a back-up or secondary drinking water source until contamination was discovered in the early 1980's. The affected wells have not been used as a drinking water source since that time. Although a small percentage of COT's drinking water supply (6% in 2002 and 2003) is still derived from municipal wells, most of these supply wells are not located within or near the SIBW site. One well is located near the western plume (COT #1). Samples from this well have not detected any VOCs.

Although the contaminated groundwater at SIBW is not primarily used for drinking water, it is classified as a drinking water source by the State of Arizona. The response action selected in this ROD Amendment is necessary to ensure continued protection of public health, welfare and the environment from actual or threatened releases of hazardous substances into the environment.

It should also be noted that because this document is a ROD Amendment, EPA guidance does not require the level of detail that would be contained in a ROD. Therefore, only a summary of risk-related information is included in this ROD Amendment. Please see Section 7.0 (Site Risks), pages II-32 to II-38, of the 1998 Groundwater ROD for more detailed risk assessment information.

A. Ecological Risk Assessment

An ecological risk assessment evaluates risks posed to ecological receptors. An ecological risk assessment need not be performed for the Groundwater OU at SIBW because groundwater does not discharge to surface water. No upwelling is known to occur in the vicinity of the Salt River, and vertical gradients are downward. Because no current or future pathways of exposure to VOC-contaminated groundwater exist for ecological receptors at SIBW, an ecological risk assessment was not performed.

B. Summary of Human Health Risk Assessment

Since the focus of this ROD Amendment is groundwater in the western plume, the information on human health risk is based on the Groundwater Risk Assessment, which is Appendix A to the Final Groundwater Feasibility Study (EPA, August 1997). This document can be found in the Administrative Record for this site.

This section briefly summarizes the results of the groundwater risk assessment. The groundwater risk assessment is a baseline risk assessment, which means it estimates what risks the Site would pose if no action is taken. It provides a basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD Amendment summarizes the results of the baseline risk assessment for this Site. This summary of the human health risk assessment includes the following elements: Identification of the chemicals of concern (COCs); Exposure assessment; Toxicity assessment; and Risk characterization.

C. Identification of Chemicals of Concern

Chemicals of Concern (COCs) are the chemicals that are the most toxic, mobile, persistent, or prevalent of those detected at a site. COCs were selected from among the entire set of chemicals associated with groundwater at SIBW. The purpose for identifying and selecting the COCs is to focus the risk assessment on the most important chemicals (i.e., those chemicals presenting 99 percent of the total risk) detected at the site.

Monitoring well samples from SIBW were analyzed for approximately sixty (60) different VOC parameters. Approximately forty-five (45) of the VOC parameters were detected at least once in the groundwater samples analyzed. PCE and TCE were detected most frequently. VOCs other than PCE and TCE were detected; however, they were detected at considerably lower frequencies.

PCE and TCE in groundwater are the COCs in the western plume as well as for all of the SIBW Site. These chlorinated solvents constitute the largest portion of the risk in the UAU. TCE and/or PCE were detected in approximately 56 percent of the samples at SIBW collected between January 1994 and February 1996, and also have been consistently detected in the same monitoring wells over many sampling periods. Because TCE and PCE are frequently detected, the potential for exposure to these contaminants is also higher. TCE is the predominant contaminant in the western plume and therefore the only COC for the western plume.

D. Exposure Assessment

Exposure refers to the potential contact of an individual with a chemical. Human exposure to chemicals is typically evaluated by estimating the amount of chemicals that could come into contact with the lungs, gastrointestinal tract, or skin during a specified period of time. The potential pathways of exposure; frequency and duration of potential exposures; rates of contact with air and water; and the concentrations of chemicals in groundwater are evaluated in the assessment of human intake of COCs.

Groundwater supply wells exist at the SIBW Site. The discovery of contamination in these wells in 1981 (see Site History) is a reason that SIBW is listed as a Superfund Site. The affected wells have not been used as a drinking water source since that time. Although a small percentage of COT's drinking water supply (6% in 2002 and 2003) is derived from municipal wells, most of these supply wells are not located within or near the SIBW site. One well is located near the western plume (COT #1). Samples from this well have not detected any VOCs.

The risk assessment therefore evaluated potential future exposures to untreated groundwater for the following domestic uses:

(1) Direct ingestion as a drinking water source (i.e., drinking and cooking); and

(2) Inhalation and dermal absorption of contaminants during bathing and showering and VOCs released to the air during cooking or the use of household appliances such as washing machines.

The magnitude of exposure to contaminants through ingestion depends on the amount of water ingested on a daily basis. The risk assessment assumed that adult residents consume 2 liters of water per day, 350 days per year for approximately 30 years. A lifetime average intake of a chemical is estimated for carcinogens. This acts to prorate the total cumulative intake over a lifetime. An averaging time of a 70-year lifetime is used for carcinogens. Chemical intake rates for noncarcinogens are calculated using an averaging time that is equal to the exposure duration.

Exposure to VOCs in air in a residential exposure scenario was estimated from an inhalation rate of 15 cubic meters per day (m^3/day). This inhalation rate considers the potential for exposure during household water uses, such as cooking, laundry, bathing, and showering. Activity-specific inhalation rates were combined with time/activity level data for populations that spend a majority of their time at home to derive daily inhalation values. The inhalation rate of 15 m^3/day was found to represent a reasonable upper-bound value for daily, indoor residential activities (EPA, 1991a).

Individuals can become exposed through dermal absorption of contaminants in water. The magnitude of potential exposure through this pathway is related to the concentration in water and surface area of exposed skin, the ability of the contaminant to penetrate through the skin, and frequency and duration of exposure.

E. Toxicity assessment

The toxicity assessment determines the relationship between the magnitude of exposure to a chemical and the adverse health effects. This assessment provided, where possible, a numerical estimate of the increased likelihood and/or severity of adverse effects

associated with chemical exposure. These toxicity values represent the potential magnitude of adverse health effects associated with exposure to chemicals, and are developed by EPA. These values represent allowable levels of exposure based upon the results of toxicity studies or epidemiological studies. The toxicity values are then combined with the exposure estimates (as presented in the previous sections) to develop the numerical estimates of carcinogenic risk and noncarcinogenic health risks. These numerical estimates are then used in the risk characterization process to estimate adverse effects from chemicals potentially originating in groundwater.

Toxicity information for the COCs at SIBW is summarized in Table 2 below.

Table 2: Toxicity Information for COCs at SIBW

Chemical of Concern	Slope Factor Ingestion 1/(mg/kg-d)	Reference Dose Ingestion (mg/kg-d)	Slope factor Inhalation 1/(mg/kg-d)	Reference Dose Inhalation (mg/kg-d)	Weight of Evidence Classification System for Carcinogenicity
Tetrachloroethene (PCE)	5.1E-02	1.0E-02	2.0E-03	1.0E-02	(Category B2) Probable human carcinogen, based on sufficient evidence in animals and inadequate or no evidence in humans
Trichloroethene (TCE)	1.1E-02	6.0E-03	6.0E-03	6.0E-03	(Category B2) Probable human carcinogen, based on sufficient evidence in animals and inadequate or no evidence in humans

F. Risk characterization

Increased lifetime cancer risk (ILCR) estimates and noncancer hazard indexes (HIs) were calculated for all compounds detected in samples at SIBW. Total ILCR and noncancer HIs were calculated by summing the risk from the ingestion, inhalation, and dermal contact pathways associated with each compound.

PCE and TCE were detected most frequently in the UAU wells. The highest ILCR associated with PCE and TCE in the UAU was 5×10^{-5} and 4×10^{-5}, respectively.

Under the NCP, remediation goals are based on Applicable or Relevant and Appropriate Requirements (ARARs) or other reliable information (NCP, 40 CFR Section 300.430(e)(2)). For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 1×10^{-4} and 1×10^{-6} using information on the relationship between dose and response. The 1×10^{-6} risk level is a point of departure for determining remediation goals when ARARs are not available or are not sufficiently protective because of the presence of multiple contaminants at a site or multiple exposure pathways. An HI (the ratio of chemical intake to the reference dose) greater than one indicates that some potential exists for adverse noncancer health effects associated with exposure to the contaminants of concern.

Action is warranted under EPA's risk assessment because if residents were exposed to TCE and PCE in the groundwater through drinking water or other routine household uses, the potential for increased cancer risks and noncancer health effects exists. Contamination presently exceeds MCLs which are standards adopted for the protection of human health. MCLs are ARARs for the restoration of drinking water and it is expected that the UAU will be restored to meet drinking water standards.

VIII. Remedial Action Objectives:

The Remedial Action Objectives (RAOs) for the groundwater below SIBW include the following:

A. Protect human health by minimizing the potential for human exposure to groundwater exceeding cleanup standards[6];

B. Cost-effectively reduce contamination in the western plume to concentrations that meet cleanup standards to return groundwater to its beneficial use to the extent practicable within a time frame that is reasonable, given the particular circumstances of the Site; and

C. Protect groundwater resources by preventing or reducing migration of groundwater contamination above ARARs.

These RAO's are identical to the specific RAO's listed for groundwater in the 1998 Groundwater ROD (page II-39). Action is warranted because groundwater contamination exceeds MCLs, which are associated with unacceptable risk to human health and the environment. It is expected that the aquifer will be restored to meet these drinking water standards. Thus, remedial actions should minimize the potential for future human exposure to contaminated groundwater.

Given these RAOs, EPA has determined that it is necessary to re-evaluate three alternatives that were assembled from the applicable remedial technology process options in the Groundwater FS. These alternatives were screened for their effectiveness, implementability, and cost. The alternatives were then evaluated in further detail against the nine criteria required by the NCP. The following section provides a description of each alternative. These alternatives consider No Action, as required by the NCP, to provide a point of comparison for other alternatives.

IX. Description of Alternatives

Three alternatives for cleanup of the western plume at SIBW were described and evaluated in EPA's February 2004 Proposed Plan. These alternatives are (1) No action; (2) Extraction and Treatment; and (3) Monitored Natural Attenuation (MNA). Detailed descriptions of the alternatives are provided later in this section.

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[6] Groundwater cleanup standards for the western plume at SIBW are detailed in Section XII.B.2. of this ROD Amendment. The cleanup standards for the COCs for the western plume are the MCLs for TCE and PCE, or 5 μg/l.

A. 1998 Groundwater ROD

The 1998 Groundwater ROD selected groundwater cleanup actions for the entire Groundwater OU at SIBW. The following actions constituted the selected remedy in the 1998 Groundwater:

(1) Extraction of the VOC-contaminated groundwater in the western plume to attain cleanup standards and hydraulic containment of the contaminated areas to inhibit both lateral and vertical migration;

(2) Treatment of extracted water to performance standards set in the 1998 Groundwater ROD using liquid granular activated carbon (LGAC), air stripping with vapor granular activated carbon (VGAC), or ultraviolet light oxidation (UV/Ox);

(3) Discharge of treated groundwater to the City of Tempe storm drain system leading to Town Lake, the SRP Tempe Canal No. 6, or reinjection;

(4) MNA of VOC-contaminated groundwater in the central and eastern plumes to attain aquifer cleanup standards within those areas, and to prevent migration of groundwater contaminated above the aquifer cleanup standards to and beyond the compliance boundaries established in the 1998 Groundwater ROD;

(5) The establishment of compliance boundaries for those areas where the MNA remedy is selected. The compliance boundaries represent borders beyond which VOC-contaminated groundwater above groundwater cleanup standards will not be allowed to migrate;

(6) Continued monitoring of groundwater to verify the effectiveness of the extraction and treatment and MNA remedies and to ensure that groundwater cleanup standards are met throughout the areas of VOC contamination;

(7) Institutional controls to protect the public from exposure to contaminated groundwater exceeding groundwater cleanup standards until cleanup standards are met;

(8) Sealing or abandonment of Well SRP23E, 2.9N to eliminate this potential path of VOC contaminant migration from the UAU to the MAU; and

(9) In the event that the MNA remedy for the central and eastern plumes was not capable of meeting the cleanup standards, a contingency remedy of extraction and treatment was also selected as part of the selected remedy in the 1998 Groundwater ROD.

The purpose of this ROD Amendment is to document the changes to the remedy selected for the western plume in the 1998 Groundwater ROD. The groundwater remedy components listed above remain in effect and enforceable unless explicitly altered by this ROD Amendment as described in Section XII. (Selected Remedy) below.

B. Components of Western Plume Alternatives

The remedial alternatives evaluated in the Proposed Plan and this ROD Amendment have common features. The Institutional Controls remedy component is common to all three alternatives and the other components listed below are common to alternatives two and three only. The common features are described below:

(1) Institutional Controls

Superfund remedies that include remediation of groundwater contamination often include institutional controls as a component. Institutional controls are administrative mechanisms that EPA uses to regulate installation of drinking water wells into areas of groundwater contamination. This is a complicated issue at SIBW because the plume(s) of groundwater contamination exists beneath numerous private properties.

The potential for the private use of groundwater via domestic wells at SIBW is very small, because potable water is provided by municipal water providers and it is not necessary to drill domestic wells. However, there is a slight possibility that a citizen could drill a well into the plume and drink contaminated water. There is also a possibility that a large volume production well could be installed in the area that could affect groundwater movement and, therefore, compromise the effectiveness of the remedy. The Arizona Department of Water Resources (ADWR) regulates groundwater use in the state. All wells drilled in the State of Arizona must be permitted by ADWR. Licensed drillers may not legally drill a well without such a permit. Arizona Administrative Code (R12-15-850) requires notifications be sent to individuals who apply for drilling permits within or near sites listed on the registry established under A.R.S. §§ 49-287.01(D)[7]. This notification informs the applicant in writing that the groundwater is contaminated and includes a map of the contaminated area. This should deter individuals from installing and using domestic drinking water wells and large volume production wells near SIBW.

Arizona's Well Spacing and Well Impact Rules regulate the placement of new and replacement production wells in Arizona. In accordance with the Well Spacing and Well Impact Rules, new production wells must be located in such a manner that nearby wells of record are not adversely affected. In addition, ADWR regulates well construction so that vertical cross-contamination between aquifers does not occur at sites such as SIBW.

(2) Compliance Monitoring

To ensure that the performance standards are met for groundwater, a long-term monitoring program was included in each alternative and the selected remedy.

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[7] Technically, 49-287.01(D) is a description of Arizona's Water Quality Assurance Revolving Fund sites. However, for such notification purposes, ADWR interprets this to mean any contaminated groundwater sites. ADWR tracks contaminated groundwater sites in the state using a GIS system. Data for this GIS system is provided by ADEQ.

The monitoring program will be designed and implemented during Remedial Design/Remedial Action (RD/RA) and will continue throughout the implementation of the selected groundwater remedy. Depending on the alternative, the monitoring may have the following objectives: to assess compliance with the remediation levels in the groundwater system, to monitor effluent chemical concentrations after VOC treatment, and to evaluate the horizontal and vertical migration of contamination. Details of the appropriate monitoring program will be determined by EPA during the RD.

(3) Five-Year Review

Five-year reviews will be conducted as a matter of policy, because it may take more than 5 years to achieve groundwater cleanup standards to allow for unlimited use and unrestricted exposure. EPA will conduct a 5-year review within 5 years of construction completion to ensure protection of human health and the environment. This review will evaluate the effectiveness of the remedy and institutional controls. An additional purpose for the review is to evaluate whether the performance standards specified in this ROD Amendment remain protective of human health and the environment. EPA will continue the reviews until no hazardous substances, pollutants, or contaminants remain at SIBW above groundwater cleanup standards. The cost of 5-year reviews was not included in the cost estimates.

C. Alternative 1: No-Action Alternative

Evaluation of the No-Action Alternative is required under CERCLA because it is used as a baseline to compare alternatives. Under this alternative, no remedial action would be undertaken to treat, contain, monitor or remove contaminated groundwater at SIBW.

Some reduction in the volume, toxicity, or mobility of the contaminants would occur as a result of unmonitored natural attenuation processes.

No treatment or containment components would be associated with this alternative. Under the No-Action Alternative, some reduction in risk would occur but it would be unquantified.

The RAOs would not be met for this alternative because contamination above MCLs would be left in place without a monitoring program to ensure that the contamination is not migrating to unaffected areas. Because the groundwater would not be monitored, it would be more likely that the public could be inadvertently exposed to contaminated water. Therefore, this alternative is not protective of human health and the environment.

To be considered a possible remedy for a hazardous waste problem, an alternative must meet EPA's two basic or "threshold" criteria. These criteria require that the remedy (1) protect human health and the environment and (2) comply with the laws and requirements of other government agencies with authority over the site ("applicable and relevant and appropriate requirements" or ARARs). Alternative 1 fails to meet EPA's threshold criteria for remedy selection because it is not protective of human health and the environment. As a result, Alternative 1 is not evaluated further.

D. Alternative 2: Extraction and Treatment of the Western Plume[8]

The Groundwater FS included several alternatives with groundwater extraction and treatment components. Alternative 2 includes extraction of the entire western plume where VOCs are above MCLs. The extracted groundwater would be piped to a centralized treatment system and the VOCs would be removed from the groundwater by one of three treatment options. The following treatment processes passed the screening of treatment options using the criteria of effectiveness, implementability, and cost:

(1) Liquid-phase granular activated carbon (LGAC)

This process option uses direct contact of the contaminated water with activated-carbon to promote adsorption of contaminants onto the carbon.

(2) Air stripping with vapor-phase granular activated carbon (VGAC) for offgas treatment

This process option combination uses air-water contacting towers to promote transfer of contaminants from the water into an airstream. The airstream is then passed through an activated carbon bed where the contaminants adsorb onto the carbon.

(3) Ultraviolet Light Oxidation (UV/Ox)

This process option uses a chemical reagent and UV light to oxidize the contaminants. The reagent used is an aqueous solution of hydrogen peroxide or ozone.

Each of these technologies would be designed to attain chemical-specific discharge requirements and to maximize long-term effectiveness and reliability while minimizing long-term operating costs.

The exact location of the treatment plant, and the exact end use for extracted groundwater would be determined during remedial design.

Routine monitoring of the groundwater before and after treatment would be conducted to assess operational conditions and ensure cleanup standards are met. Newly installed wells, in addition to existing monitoring wells, would be sampled to monitor the progress of the decreases in VOC concentrations to ensure that cleanup standards are met.

All ARARs are expected to be met. The contaminated areas that will not be hydraulically contained are expected to migrate less than 2,000 feet before reaching MCLs, and all groundwater concentrations are expected to reach MCLs within approximately 10 years.

E. Alternative 3: Monitored Natural Attenuation

Under Alternative 3, contamination in the groundwater would be reduced by natural attenuation. Groundwater contaminants would be allowed to degrade, dilute, or disperse through naturally occurring physical, chemical, and biological processes. Monitoring to verify that these processes are occurring is included in this alternative. The potential for

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[8] This alternative was the selected remedy for the western plume in the 1998 Groundwater ROD.

the biological component of the natural attenuation process to occur in the western plume at SIBW was evaluated in the Technical Memorandum entitled, "Using Monitored Natural Attenuation as a Potential Remedial Alternative for South Indian Bend Wash," (CH2M Hill Technical Memorandum[9], November 24, 2003). There is no evidence that widespread biodegradation is occurring. The physical processes of dilution and dispersion are the most significant components of natural attenuation at the site.

Groundwater monitoring would be conducted to assess and verify the effectiveness of the natural attenuation processes. Coordination with ADWR regarding well installation requirements will help minimize human health exposure to contaminated groundwater while the MNA remedy is being implemented.

Approximately 15 existing wells would be in the monitoring network and an evaluation of the necessity of additional monitoring wells would be completed as part of the Remedial Design. This evaluation will consider the location of COT municipal supply wells and determine whether monitoring wells need to be installed between the western plume and COT supply wells to ensure protectiveness.

The monitoring program for natural attenuation in this alternative will follow EPA's MNA guidance entitled "Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites," (April 1999) Final OSWER Directive, Publication EPA/540/R-99/009. Data parameters that may be required to be collected as part of a natural attenuation verification program include the following: water quality data (VOCs); dissolved oxygen (DO); nitrates; alkalinity; oxidation/reduction potential (Redox); pH; temperature; and electrical conductivity (EC).

ARARs would eventually be met in even the most contaminated areas. At the time that the 1998 Groundwater ROD was issued, EPA did not have adequate data for the western plume to demonstrate that contaminant levels were decreasing, natural attenuation was occurring, and that cleanup standards could be met within a reasonable timeframe. Since that time, EPA has gathered a significant amount of groundwater data for the western plume, including data from three new monitoring wells installed in 2001. An evaluation of the most recent groundwater data was conducted and documented in the MNA Memorandum. This memorandum includes calculations of contaminant decay rates and timeframes for meeting MCLs in the western plume. Based on EPA's evaluation of the most recent data, it has been determined that the western plume is not migrating at the rate that was anticipated at the time of the 1998 Groundwater ROD. Additionally, current data indicates that the western plume is attenuating at a rate that exceeds its lateral movement. Therefore, the plume is considered relatively stable. The current data indicate that the MNA remedy will meet cleanup standards in approximately four to five years.

In accordance with EPA's MNA guidance referenced above (EPA/540/R-99/009), a contingency remedy must also be identified for sites where MNA alternatives are selected. A contingency remedy is identified in the ROD in the event that the MNA selected remedy does not perform as expected. The contingency remedy in this case

[9] Hereinafter in this ROD Amendment, this document will be referred to as the "MNA Memorandum."

would be Alternative 2: Extraction and Treatment. This contingency remedy will be activated according to the criteria presented in Section 11 (Selected Remedy).

X. Summary of Comparative Analysis of Alternatives

The Groundwater FS presented the detailed evaluation of each alternative in the Groundwater FS using the nine evaluation criteria listed below. This evaluation is relevant to the alternatives in this ROD Amendment because these alternatives were developed from the alternatives described in the Groundwater FS. This section compares the three remedial alternatives described in Section 8.0 of this ROD Amendment. The comparative analysis provides the basis for determining which alternative presents the best balance among EPA's nine evaluation criteria listed below. The first two cleanup evaluation criteria are considered threshold criteria that must be met by the selected remedial action. The next five criteria are balanced to achieve the best overall solution. The final two modifying criteria that are considered in remedy selection are state acceptance and community acceptance.

A. Threshold Criteria

(1) Overall Protection of Human Health and the Environment addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled.

(2) Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) addresses whether a remedy will meet all federal, state, and local environmental laws and/or provides grounds for a waiver.

B. Primary Balancing Criteria

(1) Long-Term Effectiveness and Permanence refers to the ability of a remedy to provide reliable protection of human health and the environment over time.

(2) Reduction of Toxicity, Mobility, or Volume through Treatment refers to the preference for a remedy that reduces health hazards of contaminants, the movement of contaminants, or the quantity of contaminants through treatment.

(3) Short-Term Effectiveness addresses the period of time needed to complete the remedy, and any adverse effects to human health and the environment that may be caused during the construction and implementation of the remedy.

(4) Implementability refers to the technical and administrative feasibility of an alternative or a remedy. This includes the availability of materials and services needed to carry out a remedy. It also includes coordination of federal, state, and local government efforts.

(5) Cost evaluates the estimated capital and Operation and Maintenance (O&M) costs of each alternative in comparison to other equally protective alternatives.

C. Modifying Criteria

(1) State Acceptance indicates whether the state agrees with, opposes, or has no comment on the preferred alternative.

(2) Community Acceptance includes determining which components of the alternatives interested persons in the community support, have reservations about, or oppose.

The strengths and weaknesses of the alternatives were weighed to identify the alternative providing the best balance among the nine evaluation criteria. The comparative analysis of the alternatives is provided in the following discussion.

A summary of the results of the comparative analysis of the alternatives is provided in Table 3. The comparative analysis discussions are organized from the best performing alternatives to the worst performing alternatives within each criterion. Only those factors where there are substantial differences among the alternatives are discussed.

Table 3: Comparison of Alternatives with EPA's Nine Evaluation Criteria

Criteria:	**Alternative 1**	**Alternative 2**	**Alternative 3 (preferred)**
Alternative Description	No-Action	Extraction and Treatment	Monitored Natural Attenuation
Overall Protection of Human Health and the Environment	No	Yes	Yes
Compliance with ARARs	No	Yes	Yes
Long-Term Effectiveness and Permanence	No, may not be effective. Impossible to document reduction of long-term risk	Yes, cleanup standards will be met in a reasonable timeframe.	Yes, cleanup standards will be met in a reasonable timeframe.
Reduction of Toxicity, Mobility, and Volume through Treatment	No, may not reduce. Impossible to document reduction of toxicity, mobility, and volume.	Reduction will occur in less than 10 years.	Reduction will occur in less than 10 years[10].
Short-Term Effectiveness	Not applicable	Construction related risks may be significant but can be minimized.	Construction related risks will be minimal.
Implementability	Not applicable	Yes, the treatment technology is proven and readily available.	Yes, equipment and services are readily available.

[10] This reduction in toxicity, mobility and volume will not be accomplished through active treatment.

Cost			
Capital Cost	$ 0	$ 471,643	$ 398,500
Annual O&M Cost	$ 0	$ 296,264	$ 161,000
5-Year Present Worth	$ 0	$ 1,480,000	$ 1,119,000
10-Year Present Worth	$ 0	**$ 2,049,000**	**$ 1,463,000**
State Acceptance	No	No	Yes
Community Acceptance	No opposition voiced	No opposition voiced	No opposition voiced

D. Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, and/or institutional controls.

Alternative 2 is marginally more protective of human health and the environment (i.e., the groundwater resource) than Alternative 3. Under Alternative 2, all groundwater contamination in the western plume exceeding groundwater cleanup standards, or MCLs, is hydraulically contained by pumping from extraction wells, and groundwater is restored to beneficial use within a reasonable time frame. No new areas of groundwater would be impacted.

Alternative 3, the selected remedy, is also protective of human health and the environment. The southernmost portions of the western plume that exceed groundwater cleanup standards may migrate a minimal distance downgradient. However, the plume appears stable or nearly stable at this point in time. MNA is expected to reduce contaminant concentrations in the western plume so that the groundwater is restored and site risks are reduced within a reasonable time frame. Groundwater monitoring and coordination with ADWR to prevent exposure to groundwater as a result of installation of wells into the contaminated plume will provide protection of human health and the environment. No currently used groundwater wells are impaired, and MCLs will be reached in approximately four to five years.

The No-Action Alternative provides no overall protection to human health or the environment because no monitoring is performed to protect the public from exposure to contaminated groundwater.

E. Compliance with ARARs

Section 121(d) of CERCLA requires that remedial actions at CERCLA sites attain legally applicable or relevant and appropriate federal and state requirements, standards, criteria, and limitations, unless such ARARs are waived under CERCLA Section 121(d)(4).

Applicable requirements are those substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address

hazardous substances, the remedial action to be implemented at the site, the location of the site, or other circumstances present at the site. Relevant and appropriate requirements are those substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law which, while not applicable to the hazardous materials found at the site, the remedial action itself, the site location or other circumstances at the site, nevertheless address problems or situations sufficiently similar to those encountered at the site that their use is well-suited to the site.

As indicated in Table 3, Alternatives 2 and 3 (selected remedy) would fully comply with all ARARs (chemical-, location-, and action-specific). Chemical-specific ARARs for aquifer remediation would be achieved within a reasonable time (less than 10 years) for each of these alternatives.

In the event that the contingency remedy is implemented (Alternative 2), the ARARs set forth in the following paragraph and Attachment 1 (ARARs Table) shall apply to all response work, including but not limited to, construction of extraction wells and monitoring wells, construction and operation and maintenance of pipelines, and construction and operation of the groundwater treatment facility.

Subtitle C of the Resource Conservation and Recovery Act ("RCRA"), as amended, regulates hazardous waste. 40 C.F.R. § 262.11 and AAC § R-18-8-262 require waste generators to determine whether wastes from construction and operation of the remedial action are hazardous wastes and establishes procedures for such determinations. If waste generated from construction and operation of the remedial action is a hazardous waste, then the substantive provisions of RCRA regarding the management of hazardous waste is an applicable ARAR, and such waste must be managed in accordance with the applicable substantive provisions of RCRA. However, the contaminated groundwater that would be extracted pursuant to this ROD Amendment is not a listed waste because EPA has not identified the source with enough specificity to classify the untreated groundwater as a listed waste. The groundwater is also not a characteristic waste because the contaminants in the groundwater are below the levels established for the characteristic of toxicity. However, since the remedy involves treatment of wastes similar to RCRA listed hazardous wastes, EPA has determined that the RCRA regulations identified in Attachment 1 are relevant and appropriate for the contingency remedy.

The No-Action Alternative would not comply with ARARs. The No-Action Alternative provides the least compliance with ARARs because no monitoring is performed, so the areas of contamination could migrate unchecked.

Attachment 1 to this document is a detailed list of ARARs pertaining to the remedy selected in this ROD Amendment.

F. Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup standards have been met. This criterion includes the consideration of residual risk and the adequacy and reliability of controls.

(1) Magnitude of Residual Risk

Alternative 2 has the lowest magnitude of residual risk. Under this alternative, extraction and treatment of contaminated groundwater exceeding groundwater cleanup standards will reduce residual risk to acceptable levels within a reasonable time frame (less than 10 years). Untreated residual contamination in groundwater will not pose a risk to human health.

Alternative 3 is slightly higher than Alternative 2 in the magnitude of residual risk during the life of the remedy because no contaminated groundwater is extracted and treated. Alternative 3 relies entirely on natural attenuation to reduce contaminant concentrations. However, contaminants in the western plume are anticipated to meet cleanup standards (MCLs) within a reasonable time frame (less than 10 years). Similar to the other alternatives, the untreated residual contamination will not pose a risk to human health because monitoring will be implemented to document plume attenuation and coordination with ADWR will prevent exposure to groundwater.

The magnitude of residual risk under the No-Action Alternative is higher than for the other alternatives because no actions are taken to remediate contamination and no monitoring would occur to protect the public from exposure to contaminated groundwater.

(2) Adequacy and Reliability of Controls

Alternative 2 utilizes pump and treat processes that are well-established, reliable, and capable of meeting performance requirements. No difficulties associated with the long-term operation of this alternative are anticipated. VGAC carbon replacement and routine maintenance of air stripping towers, UV/Ox systems, and extraction wells will be required, but such maintenance is standard for groundwater cleanup actions. Long-term monitoring will assess and ensure the adequacy of the alternatives at meeting cleanup objectives.

Under Alternative 3, the adequacy and reliability of the MNA to meet cleanup standards is somewhat less certain than the pump and treat actions taken under Alternative 2, but MNA is also expected to reach cleanup standards in a reasonable time frame. In addition, contingency criteria have been identified to activate extraction and treatment of the western plume if MNA fails. This increases the overall reliability of Alternative 3 to meet cleanup standards.

The No-Action Alternative is inadequate and not reliable because no actions are taken, and no monitoring is conducted.

G. Reduction of Toxicity, Mobility, or Volume through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

(1) Treatment Processes Used and Materials Treated

Alternative 2 would use treatment trains which may consist of air stripping with VGAC, LGAC, or UV/Ox to treat the contaminated groundwater extracted from the western plume.

Under Alternative 3 and the No-Action Alternative no treatment processes are used.

(2) Degree of Expected Reductions in Toxicity, Mobility, or Volume

Under Alternative 2, air stripping, LGAC, or UV/Ox will remove 99.9 percent of the VOCs in the groundwater extracted from the western plume. The volume of contaminated groundwater at concentrations exceeding groundwater cleanup standards is hydraulically contained and gradually reduced through groundwater pumping.

Alternative 3 will not actively reduce toxicity, mobility, or volume of groundwater contamination at SIBW. However, for Alternative 3 the reductions in contaminant toxicity in the aquifer that will occur as the result of naturally occurring processes will be significant.

The No-Action Alternative does not provide any reduction in toxicity, mobility, or volume through active treatment.

(3) Degree to Which Treatment is Irreversible

Under Alternative 2, air stripping, LGAC, or UV/Ox are inherently irreversible treatment processes. Although MNA (under Alternative 3) is not an active treatment process, it is highly unlikely that such processes will be reversed.

(4) Type and Quantity of Treatment Residual

Under Alternative 2, it is assumed that air stripping treatment would transfer VOCs to air, and this offgas generated from the air stripping would be treated using VGAC. It is possible that LGAC, UV/Ox may be used as the treatment option for the selected alternative. However, the calculations of spent carbon for this alternative is based on use of air stripping with VGAC offgas treatment. The quantity of spent carbon generated under Alternative 2 would be approximately 44,000 pounds per year.

No treatment residuals are generated under Alternative 3 and the No-Action Alternative.

H. Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers and the community during construction and operation of the remedy until cleanup goals are achieved.

The No-Action Alternative would not pose any short-term risk issues because no actual work would be completed. This alternative is therefore not discussed further in this section.

(1) Protection of Community and Workers During Remedial Action

The implementation of Alternative 3 may not pose any risks to the community if no additional natural attenuation monitoring wells need to be installed. If additional monitoring wells are determined to be necessary, Alternative 3 will

still pose only minimal risks to the community and workers associated with the installation of these wells.

Alternative 2 involves construction of a groundwater treatment plant using air stripping/VGAC, LGAC, or UV/Ox treatment, installation of conveyance pipeline, and installation of extraction and monitoring wells. There would be risks of potential exposure to contaminants posed to the community and workers as a result of such construction activities. These risks would be controlled by following proper health and safety procedures. Air emissions from the treatment unit will meet local air district emissions requirements.

For both Alternatives 2 and 3, coordination with ADWR to prevent exposure to groundwater as a result of installation of wells into the contaminated plume will provide protection of human health and the environment until cleanup goals are achieved.

(2) Environmental Impacts

Alternative 3 poses only minimal risks to the environment associated with the potential installation of natural attenuation monitoring wells. Good work practices will provide environmental protection during such well installation activities.

As described above, Alternative 2 involves construction on a much larger scale than Alternative 3. Due to the complexity and scope of these construction activities, environmental risks are a factor for Alternative 2. Such environmental risk factors include disruption of natural groundwater conditions, consumption of energy for treatment, creation of treatment residuals, and use of disposal capacity for treatment residuals.

Air emissions from the treatment plant installed for Alternative 2 will meet local air district emissions requirements that are set to be protective of the environment. Similarly, discharge of treated groundwater will comply with appropriate regulations for discharge to surface water or aquifer reinjection.

(3) Time Until Remedial Objectives are Achieved

The estimated times until cleanup standards will be achieved under Alternatives 2 and 3 are as follows:

a. Alternative 2: Extraction and Treatment

The groundwater cleanup standards will be met in approximately nine years using extraction and treatment. EPA's most recent extraction duration estimates are presented in the memorandum entitled "Estimated Duration of Pump and Treat Remedy, Western Plume, Tempe, Arizona," (CH2M Hill Technical Memorandum, April 22, 2003).

b. Alternative 3: Monitored Natural Attenuation

The groundwater cleanup standards will be met in approximately four to five years. EPA's most recent MNA remedy duration estimates are presented in the MNA Memorandum.

As shown above, the time to meet remedial objectives in the western plume using the active remedy (extraction and treatment, 9 years) is greater than using the passive remedy (MNA, 4 - 5 years). This counter-intuitive result is a result of the differing assumptions made as part of each model. The model of Alternative 2 assumes that groundwater extraction is the only mechanism reducing contaminant concentrations in the plume. It does not consider that MNA will be occurring concurrently with extraction, which will reduce the time required to meet remedial objectives. Considering the factors described above, EPA is reasonably certain that Alternatives 2 and 3 will reduce the levels of TCE in the western plume and meet the groundwater cleanup standards in less than 10 years. Therefore, when EPA considered duration as a criteria for remedy selection, Alternatives 2 and 3 were both considered capable of meeting the groundwater cleanup standards (MCLs) in less than 10 years.

I. Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

The No-Action Alternative would not pose any implementability issues because no actual work would be completed. This alternative is therefore not discussed further in this section.

(1) Ability to Construct and Operate the Technology and Reliability of the Technology

All of the alternatives are expected to be readily constructed and operated using reliable technologies. Although the natural attenuation technology is less proven than the pump and treat technologies, it is expected to be reliable. Alternative 3 presents fewer potential implementation problems than Alternative 2 because considerably less construction is necessary for MNA.

Alternative 2 involves construction of air stripping/ VGAC, LGAC, or UV/Ox treatment plant, installation of conveyance pipelines, and installation of extraction and monitoring wells. Although, the treatment components of Alternative 2 are commonly employed and not exceptionally difficult to construct or operate, due to the complexity and scope of this alternative, difficulties during construction are likely to be encountered.

Because SIBW is located in a developed industrial/commercial area, difficulties may arise associated with the installation of conveyance pipelines for Alternative 2. Complications caused by obtaining required utility clearances, implementing traffic controls, and obtaining easements may also be encountered for Alternative 2. Such implementability difficulties will be more significant for Alternative 2 than Alternative 3 because considerably more construction would be required for Alternative 2.

(2) Ability to Monitor Effectiveness of Remedy

No difficulties in the ability to monitor the effectiveness of the remedy are anticipated under Alternatives 2 and 3. Groundwater monitoring will be conducted to monitor the effectiveness of each remedy at reducing contaminant concentrations.

However, additional monitoring will be required for Alternative 2. For this alternative, treatment plant air emissions and treated water effluent monitoring will be conducted to ensure that emissions and discharge requirements are met.

(3) Coordination with Other Agencies

Under each of the alternatives, it is anticipated that some level of coordination between EPA, ADEQ, ADWR, and the City of Tempe will be required. Although, the level of effort required to accomplish this coordination for each alternative is somewhat uncertain, it is known that ADEQ and ADWR (as support agencies to EPA) will be given the opportunity review and provide input on Remedial Design and Remedial Action deliverables. Other interagency coordination issues may include the following.

Under Alternative 3, EPA will need to coordinate with state and local agencies including ADWR, ADEQ, and the City of Tempe (e.g., to attain necessary substantive permit requirements). Specifically, coordination with ADWR in relation to Arizona's Well Spacing and Impact Rules will serve to minimize exposure to contaminated groundwater.

Under Alternative 2, coordination between EPA and ADEQ will be required concerning substantive water quality requirements for treated water discharges. The exact coordination would be determined following selection of end use during Remedial Design.

(4) Availability of Offsite Treatment, Storage, and Disposal Services and Capacity

Under Alternative 3, contaminated groundwater that is purged from monitoring wells during sampling may be disposed of in the City of Tempe sanitary sewer system if the discharge requirements are met.

For Alternatives 2, a vendor will be used to remove, transport, and dispose of spent carbon from VGAC or LGAC units. These types of vendors are readily available and have sufficient capacity to handle the volume of carbon to be used at SIBW.

Under Alternative 2, treated groundwater will be discharged to surface water or reinjected into the aquifer. The discharge end-use options under consideration will be able to accommodate the maximum estimated flow rate from the treatment plant under normal conditions.

J. Cost

Table 3 on page 31 lists the capital, annual O&M, 5-year present worth and 10-year present worth costs for each alternative. The estimated 10-year present worth for the alternatives range from $0 for Alternative 1 to $2,049,000 for Alternative 2.

The difference between the cost of Alternatives 2 and 3 is not extremely significant. The additional cost for Alternative 2 cannot be justified from a cost-benefit standpoint because Alternative 2 is only slightly more protective than Alternative 3.

Under Alternative 3, MNA will meet the same RAOs in approximately the same time period as Alternative 2 but at a reduced cost. The selected alternative costs approximately one half million dollars less than Alternative 2.

K. State Acceptance

The State of Arizona's Department of Environmental Quality and the Arizona Department of Water Resources both support the selection of Alternative 3. The State agencies do not accept Alternative 2 because this alternative costs more than Alternative 3 and does not provide proportionally better protection of human health and the environment or long-term effectiveness.

L. Community Acceptance

There has been very little community interest during the process of issuing this ROD Amendment. One individual attended the public meeting and one individual submitted written comments during the comment period. The only concern was that EPA take into consideration the fact that the City of Tempe uses groundwater as a drinking water source under certain conditions. To do this, EPA will require the Remedial Design for MNA in the western plume to include a survey of the location of all COT supply wells in the vicinity of the western plume. Based on the survey, an evaluation of the necessity for additional monitoring wells between the plume and the COT supply wells will be conducted to ensure these supply wells are not effected.

Because there was no opposition voiced to the preferred remedy, EPA can only surmise that the community accepts the remedy as proposed.

XI. Principal Threat Wastes

The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. This ROD Amendment only applies to contaminated groundwater. Contaminated groundwater generally is not considered to be a source material. Therefore, principal threat waste was not considered for this ROD Amendment.

XII. Selected Remedy: Preferred Alternative

Based on current information, EPA is selecting Alternative 3, which requires restoration of the western plume to drinking water standards (MCLs) via reduction of VOCs by Monitored Natural Attenuation (MNA). Groundwater contaminants would be allowed to degrade, dilute, or disperse through naturally occurring physical, chemical, and biological processes.

Groundwater monitoring is required as part of the selected remedy to assess and verify the effectiveness of the natural attenuation processes. The monitoring program for natural attenuation for the selected remedy shall follow EPA's MNA guidance titled "Use of Monitored

Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites," (April 1999) Final OSWER Directive, Publication EPA/540/R-99/009.

Approximately 15 existing wells would be in the monitoring network and an evaluation of the necessity of additional monitoring wells to ensure the effectiveness of the selected remedy would be completed as part of the Remedial Design. This additional well evaluation will include identification of sentinel wells. Sentinel wells can be existing wells or newly installed wells. The function of the sentinel wells will be to identify a boundary for migration of contamination above cleanup standards. If monitoring data identifies contamination above cleanup standards in sentinel wells, then the groundwater contingency action (Alternative 2) may be triggered as described below.

Data parameters that may be required to be collected as part of a natural attenuation verification program include but are not limited to the following: water quality data (VOCs); dissolved oxygen (DO); nitrates; alkalinity; oxidation/reduction potential (Redox); pH; temperature; and electrical conductivity (EC). Actual parameters to be collected shall be defined in a long-term groundwater monitoring sampling and analysis plan which will be developed as part of RD/RA.

Coordination with ADWR regarding well installation requirements will help minimize human health exposure to contaminated groundwater while TCE is still present above the MCL.

In accordance with EPA's MNA guidance referenced above (EPA/540/R-99/009), a contingency remedy must also be identified for sites where MNA alternatives are selected. Therefore, a contingency remedy has been identified in this ROD Amendment as part of the selected remedy in the event that MNA does not perform as expected. The contingency remedy in this case is Alternative 2: Extraction and Treatment. This contingency remedy may be triggered to satisfy the following two criteria: (1) attaining cleanup standards within a reasonable time frame of approximately 10 years, and (2) preventing migration of groundwater contaminated above the cleanup standards beyond the sentinel wells. The contingency remedy may be triggered if any of the following situations occur:

(1) If routine sampling at the sentinel wells confirms that data collected during quarterly sampling exceed the cleanup standards, and if the average contaminant concentration for the next two consecutive quarterly sampling rounds from this well exceeds the cleanup standards, then the contingency remedy may be activated. The contingency remedy may be implemented sooner, if needed.

(2) If routine sampling begins to show a trend of increasing contamination at key wells in the monitoring network (e.g., SIBW-28U), then additional investigation shall be conducted as approved by EPA. If it is concluded based on this additional investigation that MNA processes are no longer working effectively or that cleanup standards are not likely to be met, then the contingency remedy may be activated.

(3) If any COT groundwater supply well becomes endangered due to migration of the plume.

The selected remedy meets the two NCP threshold evaluation criteria of overall protection of human health and the environment and compliance with ARARs, provides the best balance of tradeoffs based on the primary balancing criteria, and is acceptable to the State of Arizona and the community.

A. Summary of the Rationale for the Selected Remedy

At the time that the 1998 Groundwater ROD was issued, EPA did not have adequate data for the western plume to demonstrate that contaminant levels were decreasing, natural attenuation was occurring, and that cleanup standards could be met within a reasonable timeframe. Since that time, EPA has gathered a significant amount of groundwater data for the western plume, including data from three new monitoring wells installed in 2001. An evaluation of the most recent groundwater data was conducted and documented in the MNA Memorandum. This technical memorandum includes calculations of contaminant decay rates and timeframes for meeting cleanup standards in the western plume.

Based on EPA's evaluation of the most recent data, it has been determined that the western plume is not migrating at the rate that was anticipated at the time of the 1998 Groundwater ROD. Additionally, current data indicates that the western plume is attenuating at a rate that exceeds its lateral movement. Therefore, the plume is considered relatively stable. The current data indicate that the MNA remedy will meet cleanup standards in approximately four to five years. Therefore, it is not necessary to implement the remedy selected in the 1998 Groundwater ROD in order to protect human health and the environment. It is more cost-effective to change the 1998 Groundwater ROD as described in this ROD Amendment.

B. Description of the Selected Remedy

The performance standards for the Selected Remedy Alternative 3 are as follows:

(1) Groundwater Monitoring

a. A long-term groundwater monitoring sampling and analysis plan (GMP) shall be developed which will be designed to document MNA in the western plume.

b. The GMP shall identify the sentinel wells which will help EPA evaluate the need to trigger the contingency remedy.

c. The GMP shall identify criteria for determining that cleanup standards have been met and the Remedial Action is complete.

(2) Groundwater Cleanup Standards

a. The COCs for the western plume at SIBW are TCE and PCE.

b. The cleanup standards for TCE and PCE are set by this ROD Amendment as the MCLs for these contaminants which is 5 μg/l.

c. Although PCE is currently not present above the MCL in the western plume, it is identified here in case there is an increasing trend of contamination concentrations in the future.

(3) Aquifer Restoration

The UAU in the vicinity of the western plume shall be restored to its beneficial use as a drinking water aquifer.

C. Summary of the Estimated Remedy Costs

The estimated cost for the Selected Remedy (Alternative 3) is detailed in the Table 4 below. The costs are broken down into: capital costs, projected annual O&M cost, periodic costs, 5-year Present Worth, and 10-year Present Worth.

Table 4: Alternative 3 Cost Estimate

Description	Cost
CAPITAL COSTS	
Monitoring Well Installation (2 UAU, 1 MAU)	$ 205,000
Design MNA Remedy	$ 30,750
Groundwater Modeling	$ 50,000
Project Administration	$ 16,400
Construction Management	$ 20,500
Permitting	$ 4,100
Contingency	$ 71,750
Capital Cost Subtotal	$ 398,000[11]
PROJECTED ANNUAL O&M COSTS[12]	
Water Level Measurements	$ 4,000
Water Quality Sampling (Quarterly)	$ 25,600
Analytical Costs	$ 54,000
Additional Cost for Annual Sampling	$ 14,000
MNA Parameter Monitoring	$ 4,640
Voluntary Actions	$ 5,000

[11] For cost estimating purposes, the subtotal categories are rounded to the nearest thousand.

[12] The O&M Costs detailed in this table are for phase one of the sampling program. It is anticipated that the number of wells sampled and sampling frequency will decrease in later years of sampling. The present worth estimates take this into account. See Table 2 of the MNA Memorandum for details.

Reporting	$ 24,000
Administration	$ 22,000
Indirect Costs	$ 7,289
Subtotal	$ 161,000
PERIODIC COSTS	
Monitoring Well Rehabilitation (every 5 years)	$ 112,500
Pump Replacement (every 10 years)	$ 75,000
5-Year Review (every 5 years)	$ 50,000
Subtotal	$ 237,000
5-YEARS PRESENT WORTH	
	$ 1,119,000
10-YEARS PRESENT WORTH	
	$ 1,463,000

The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the selected remedy. This assumes that the cleanup standards will be met using MNA. If it is necessary to invoke the contingency remedy (Alternative 2), then the costs will increase. Changes in the cost elements are also likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major or significant changes may be documented in the form of a memorandum in the Administrative Record file, an Explanation of Significant Difference, or a second ROD Amendment, as appropriate. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

D. Expected Outcome of the Selected Remedy

The expected outcome of the selected remedy is the restoration of the UAU in the vicinity of the western plume to beneficial use (drinking water source) after cleanup levels for the contaminants of concern are achieved in an estimated 10 years. Cleanup levels for TCE and PCE in groundwater are MCLs (see Section XII.B.2 of this ROD Amendment (Cleanup Standards)).

XIII. Statutory Determinations

Under its legal authorities, EPA's primary responsibility at Superfund sites is to undertake remedial actions that achieve adequate protection of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences. These specify that, during the implementation and upon completion of, the selected remedial action must comply with applicable or relevant and appropriate environmental standards established under federal and State environmental laws unless a waiver is justified.

The selected remedy must also be cost-effective and utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as their principal element. The following section discusses how the selected remedy addresses these statutory requirements and preferences.

A. Protection of Human Health and the Environment

Exposure to contaminated groundwater through drinking water supplies is the only area of potential risk. It is highly unlikely that such exposure will occur because the City of Tempe's main source of drinking water is surface water. The selected remedy will ensure that the contaminated groundwater in the western plume meets drinking water standards. Since no exposure to site-related contaminants should occur, actual exposure levels will be pose a risk of less than one in a million for carcinogenic risk and below the Hazard Index of 1 for non-carcinogenic risk.

The remedy will not have detrimental cross-media impacts. MNA does not involve air emissions or discharges to surface water.

B. Compliance with Applicable or Relevant and Appropriate Requirements

Remedial actions selected under CERCLA must comply with all ARARs under federal environmental laws or, where more stringent than the federal requirements, State environmental or facility siting laws. Where a State has delegated authority to enforce a federal statute, such as RCRA, the delegated portions of the statute are considered to be a Federal ARAR unless the State law is broader or more stringent than the federal law. Applicable or relevant and appropriate requirements are identified on a site-specific basis from information about site-specific chemicals, specific actions that are being considered, and specific features of the site location. There are three categories of ARARs: (1) chemical-specific requirements; (2) action-specific requirements; and (3) location-specific requirements.

Chemical-specific ARARs are risk-based cleanup standards or methodologies which, when applied to site-specific conditions, result in the development of cleanup standards for COCs.

Location-specific ARARs are restrictions placed on health-based concentrations of hazardous substances or the conduct of activities because of the special locations, which have important geographical, biological or cultural features. Examples of special locations include wetlands, flood plains, sensitive ecosystems and seismic areas.

Action-specific ARARs are technology-based or activity-based requirements or limitations on actions to be taken to handle hazardous wastes. They are triggered by the particular remedial activities selected to accomplish a remedy.

The selected remedy will comply with all ARARs. The ARARs for actions identified in this ROD Amendment can be found in Attachment 1 of this document.

C. Cost-Effectiveness

In EPA's judgement, the selected remedy is cost-effective and represents a reasonable value. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." [Note: NCP Section 300.430(f)(1)(ii)(D)] This was accomplished by evaluating the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., the alternatives are both protective of human health and the environment, and ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness. The relationship of the overall effectiveness of remedial Alternative 3 was determined to be proportional to its costs and hence this alternative represents a reasonable value for its cost.

D. Utilization of Permanent Solutions and Alternative Treatment Technologies to the maximum Extent Practicable

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at SIBW. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that Alternative 3 provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and considering state and community acceptance.

E. Preference for Treatment as A Principal Element

The selected remedy does not include active treatment as a principal element. However, MNA will achieve the groundwater cleanup levels in a reasonable timeframe (less than 10 years) and in a cost-effective manner. EPA has made the determination that the additional expense of actively treating the groundwater in the western plume at SIBW would not provide significantly greater protection of human health and the environment and therefore is not justified.

F. Five-Year Review Requirements

Because this remedy will not result in hazardous substances, pollutants, or contaminants remaining within SIBW above levels that allow for unlimited use and unrestricted exposure, but it may take more than five years to attain remedial action objectives and cleanup levels, a policy review will be conducted within five years of construction completion for SIBW to ensure that the remedy is, or will be protective of human health and the environment.

XIV. Documentation of Significant Changes

EPA has not made any changes to the remedy as a result of comments received during the comment period. The Responsiveness Summary includes a summary of comments received and EPA's response to these comments.

PART 3: THE RESPONSIVENESS SUMMARY

The volume of community comments on the SIBW Proposed Plan was extremely light. An oral comment from one individual was received and recorded at the public meeting held on March 11, 2004. One comment letter addressing the same issue as the oral comment was received during the comment period. This comment was presented by the City of Tempe. Overall, the City supported the preferred alternative.

The comment letter and the transcript of the public meeting can be found in the Administrative Record. A summary of the comment received and EPA's response are as follows.

Comment: The City wanted to make it clear that although a majority of its drinking water supply is derived from surface water sources, they do not rely solely on surface water as indicated in the Proposed Plan. Several groundwater wells are used to supplement the City's municipal water supplies in times of drought. Tempe has experienced drought conditions for several years now and as a result in 2002 and 2003 approximately 6% of Tempe's municipal water supply was derived from groundwater wells. The City also identified the specific wells (COT#1 and COT #4) that are located in the vicinity of the western plume.

EPA Response: Information regarding Tempe's use of groundwater to supplement its municipal water supply has been included in this ROD Amendment. EPA has also included a requirement in this ROD Amendment to evaluate the location of wells used by the City and to determine if it is necessary to install additional groundwater monitoring wells between the western plume and the City wells to ensure that the supply wells are not being affected by the SIBW Site. This work will be conducted as part of the remedial design for MNA in the western plume.

Attachment 1 - Description of ARARs for Selected Remedy			
Authority	**Description**	**Status**	**Comments**
Chemical-Specific ARARs			
Federal Safe Drinking Water Act 42 U.S.C. 300g-1, 40 CFR 141.161	Establishes Maximum Contaminant Levels (MCLs) for drinking water supplies.	Applicable	MCLs have been established for a number of common organic and inorganic contaminants. These levels regulate the concentrations of contaminants in public drinking water supplies. The selected remedy will comply with these requirements. The cleanup levels for the VOCs in the aquifer are set at MCLs.
Clean Water Act 33 U.S.C 1311-1387	Establishes Water Quality Criteria for surface waters	Relevant & Appropriate	The CWA Water Quality Criteria are designed to protect aquatic life (both marine and freshwater). These standards are expressed on the basis of acute and chronic toxicity levels. In the event that the contingency remedy was determined to be necessary, the contingency remedy would comply with these requirements. Any treated groundwater that would be discharged into a surface water body would meet the CWA Water Quality Criteria.
Clean Water Act 40 CFR 402, 405-471; 40 CFR 125; AAC § R18-9-A901	Establishes the Arizona Pollutant Elimination Discharge System (AZPDES) Permit Program	Relevant & Appropriate	The AZPDES permit program regulates discharges into "waters of the United States" by establishing numeric limits and monitoring requirements for such discharge. In the event that the contingency remedy was determined to be necessary, the contingency remedy would comply with these requirements. The discharge of treated water to any surface water body shall meet the substantive requirements of an AZPDES permit.
Location-Specific ARARs			
Clean Air Act 42 U.S.C. 7401 et seq.	Establishes National Ambient Air Quality Standards (NAAQS)	Relevant & Appropriate	NAAQSs are numeric limits for contaminants in air emissions. These requirements apply to all treatment systems that discharge emissions. In the event that the contingency remedy was determined to be necessary, the remedy shall comply with the air discharge requirements of the CAA (NAAQS).

Attachment 1 - Description of ARARs for Selected Remedy			
Authority	**Description**	**Status**	**Comments**
40 CFR Part 50 and 40 CFR Part 52 Subpart D; AAC § R18-2-201 to 220 and § R-18-2-730 (D) & (G)	Requires compliance with local air standards	Relevant & Appropriate	Any source of criteria pollutants located in an NAAQS non-attainment area must comply with local air quality regulations. SIBW is located in Maricopa County which is a non-attainment area for ozone, carbon monoxide (CO) and particulate matter less that 10 microns in size. In the event that the contingency remedy was determined to be necessary, the selected remedy would comply with these emissions standards.
Maricopa County Air Pollution Control Regulations Rule 320 § 302	Mandates that no person shall emit gaseous or odorous air contaminants from equipment, operations or premises under his control in such quantities or concentrations as to cause air pollution.	Relevant & Appropriate	In the event that the contingency remedy was determined to be necessary, since the means are available to reduce effectively the contribution to air pollution from being discharged from the air stripping units, the installation and use of such control methods, devices or equipment shall be mandatory.
Resource Conservation and Recovery Act 42 U.S.C. 6901 et.seq. 40 CFR 264.18(a) &(b)	Regulates activities in earthquake zones and 100-year floodplains	Relevant & Appropriate	A RCRA facility located in areas where earthquakes could occur and 100-year floodplains must be designed, constructed, operated and maintained to prevent damage due to earthquakes or washout of any hazardous waste by a 100-year flood. Since the treatment facilities will generate hazardous waste, any facility constructed within an earthquake zone or a 100-year floodplain shall comply with this requirement.

Attachment 1 - Description of ARARs for Selected Remedy			
Authority	**Description**	**Status**	**Comments**
National Archaeological and Historical Preservation Act 16 U.S.C. 469; 36 CFR Part 65	Protection of archaeological and historical artifacts	Relevant & Appropriate	Alteration of terrain that threatens significant scientific, prehistoric, historic, or archaeological data may require actions to recover and preserve artifacts. The selected remedy will not alter or destroy any known prehistoric or historic archeological features at or near the SIBW site. The building on the DCE Circuits subsite is included in the National Register of Historic Places (Inventory No. 151). The groundwater remedy at SIBW will not affect this building. The areas in and around SIBW are essentially completely developed. However, because there is always a possibility that buried historic or prehistoric remains could be discovered during construction, this regulation would require action to recover and preserve such artifacts.
Endangered Species Act 16 U.S.C. 1531-1544; 50 CFR Part 200 and 50 CFR Part 402	Protects critical habitat upon which endangered species or threatened species depend.	Relevant & Appropriate	Requires action to conserve endangered species or threatened species, including consultation with the Department of Interior, Fish and Wildlife Service. There are currently no known endangered species existing at SIBW. However, because there is always a possibility that endangered species could be discovered during implementation of the selected remedy, any action that may impact or threaten the impact an endangered species shall comply with this requirement.
Action-Specific ARARs			
Arizona Groundwater Management Act A.R.S. §§ 45-454.01, 45-494, 45-495, 45-496 and 45-600	Requirements for wells, groundwater withdrawal, treatment, and reinjection	Applicable	Subject to compliance with certain substantive provisions, this regulation exempts new well construction, withdrawal, treatment, and injection wells at CERCLA sites from obtaining ADWR approval. The substantive standards set forth in these sections will be complied with in construction and logging of new wells.

Attachment 1 - Description of ARARs for Selected Remedy			
Authority	**Description**	**Status**	**Comments**
RCRA Subtitle C: ARS § 49-921 et seq., 40 CFR § 264.1(j)(2-5, 10-12); AAC § R18-8-264.1 (j)(2-5, 10-12)	Requirements for remediation waste management sites	Relevant and Appropriate	In the event that the contingency remedy was determined to be necessary, these regulations would require waste analysis, inspections, personnel training, and contingency & emergency plans.
RCRA Subtitle C: ARS § 49-921 et seq., 40 CFR Part 264, Subpart G, §§ 264.111 (a&b) and 264.114; AAC § R18-8-264.111 (a&b) and 264.114	Closure performance standards and requirements	Relevant and Appropriate	In the event that the contingency remedy was determined to be necessary, these requirements would be relevant to the closure of the groundwater treatment plant.
RCRA Subtitle C: ARS § 49-921 et seq., 40 CFR § 264.601(a), (b), and (c); AAC § R18-8-264.601(a), (b), and (c)	Establishes performance standard requirements for owners and operators of miscellaneous treatment units	Relevant and Appropriate	Miscellaneous treatment units must satisfy environmental performance standards by protection of groundwater, surface water, and air quality, and by limiting surface and subsurface migration. Air stripping towers are considered to be miscellaneous RCRA units. Therefore, in the event that the contingency remedy was determined to be necessary, the substantive portions of these requirements would be relevant in the construction, operation and maintenance and closure of *air stripping units at SIBW.*
A.R.S. § 49-221: AAC § R18-11-101 et seq.	Regulates discharges to surface water	Applicable	Discharge from treatment systems must comply with Arizona State Water Quality Standards for Surface Waters. In the event that the contingency remedy was determined to be necessary, this requirement may be relevant if treated water is discharged to surface water (Arizona Canal System).
A.R.S. § 49-224	Aquifer identification and classification	Relevant and Appropriate	All aquifers in the state identified under § 49-222(A) and any other aquifers subsequently discovered shall be classified for drinking water protected use.
40 CFR Part 122 and Part 125	Regulates discharges to surface water	Applicable	Establishes, treatment and monitoring requirements for discharges to surface water. In the event that the contingency remedy was determined to be necessary, the substantive requirements of the NPDES program would be applicable if treated groundwater is discharged to surface water (Arizona Canal System).

40 CFR § 144.12 - 144.16	Criteria and standards for the Underground Injection Control (UIC) Program	Applicable	These criteria include current and future use, yield and water quality characteristics and are relevant at SIBW for determining exempt aquifers. In the event that the contingency remedy was determined to be necessary, injection wells (if used at SIBW) would comply with these design, construction, operation and maintenance requirements.
Arizona Well Spacing and Well Impact Rules AAC § R12-15-830	Regulates the placement of new production wells in the state of Arizona	Relevant and Appropriate	New production wells may not be permitted in the SIBW area, if it is determined that operation of such wells may have cause groundwater contamination at SIBW to migrate.
Arizona Well Notification AAC § R12-15-850	Requires notifications to well permit applicants	Relevant and Appropriate	If an application for a well permit is submitted for an area near a contaminated site, the applicant shall be notified of the location of the contamination.
AAC § R18-4-(501-502)	Identifies minimum design criteria for treatment units	Applicable	In the event the contingency remedy was determined to be necessary, the minimum design criteria identified in these regulations would have to be complied with while constructing the groundwater treatment plant.

U.S.C. - United States Code
CFR - Code of Federal Regulations
A.R.S. - Arizona Revised Statutes
A.A.C. - Arizona Administrative Code